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DEVOTED TO THE ART

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JOURNAL OF ORAL SURGERY

Fred A. Henny, D.D.S., Editor
HENRY FORD HOSPITAL, DETROIT

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VOLUME 13 • JANUARY 1955 • NUMBER 1 JOURNAL OF ORAL SURGERY

The expanding field of oral surgery

■ *James R. Cameron, D.D.S., Sc.D., Philadelphia*

Oral surgery is the oldest specialty of dentistry. James E. Garretson, in the year 1864, introduced oral surgery as a major subject in the dental curriculum of the Philadelphia Dental College, now the School of Dentistry, Temple University. He was the first professor of oral surgery to be appointed to a dental faculty and is credited generally as being the father of this specialty. The field of oral surgery, as practiced today, is vastly different from that in the days of Doctor Garretson; and, could Doctor Garretson return to this world and observe what has happened to the seeds he planted so carefully, his heart would sing within itself. Doctor Garretson visualized the important role that oral surgery was destined to play in the future development of dentistry and emphasized and re-emphasized the need for a broader education of dentists so that they would fulfill adequately the requirements of this specialty, which then, as up to the present, was given little consideration in the undergraduate curriculum of most medical schools. His farsighted conception of what the field of oral surgery could eventually embrace stimulated the interest of his students and those who were to follow in the development of this part of dental practice.

With few exceptions, however, dentists were reluctant to expand their practice largely because of the lack of an official definition of this specialty that would bring it within the legal domain of dentistry. Credit must be given to the officers and members of the American Dental Association for undertaking an exhaustive study of the various Dental Practice Acts and obtaining legal interpretation of these various Acts as applied to the specialty of oral surgery. As members of the American Dental Association, oral surgeons are now fortified by a definition of oral surgery as a specialty of dentistry. The following definition and outline of the scope of oral surgery was passed unanimously by the Board of Trustees and the House of Delegates of the American Dental Association at the annual session in Cleveland in September 1953:

Presented before the fifty-second annual session, Hawaii Territorial Dental Society, Honolulu, June 23-26, 1954.

The specialty of oral surgery is that part of dental practice which deals with the diagnosis, the surgical and adjunctive treatment of the diseases, injuries and defects of the human jaws and associated structures.

The scope of the specialty of oral surgery shall include the diagnosis and the surgical and adjunctive treatment of the diseases, injuries and defects of the human jaws and associated structures within the limits of the professional qualifications and training of the individual practitioner and within the limits of agreements made at the local level by the health team concerned with the total health care of the patient.

This definition and outline of the scope of oral surgery, as passed by the Board of Trustees and the House of Delegates of the American Dental Association, gives the dentist wishing to specialize in the field of oral surgery a clear understanding of what is expected of a well-trained oral surgeon. To fulfill these requirements, a dentist will require additional training over and above that received in the undergraduate curriculum of a dental school.

In order that dentists can meet the higher qualifications now required to practice oral surgery in its broadest sense, graduate training programs have been established in various universities which have superseded the short postgraduate courses formerly considered adequate to qualify dentists in this specialty. Gone are the days when a dentist, on completion of a few weeks instruction within the four walls of a specialist's office, could consider himself qualified as an oral surgeon. The field of oral surgery, as practiced today, is entirely too broad for such instruction to be adequate. The graduate training programs offered by various universities are designed to present, systematically and comprehensively, to graduate dentists a well-correlated course in the basic sciences as applied to the practice of oral surgery.

On completion of such basic studies, covering a full academic year, the graduate dental student then serves two or more years in an accredited hospital maintaining an active oral surgery staff and service. During this period of clinical training, the resident in oral surgery has close association with the residents in medicine and surgery and the surgical specialties. He, also, has an opportunity to observe the practice of the medical and surgical staff and may attend the various staff conferences where the treatment of patients is reviewed and evaluated. Such training offers the young oral surgeon an opportunity for a broad and intelligent approach to the understanding and behavior of the various diseases and injuries which he will encounter later in his private practice. He will develop a broader conception of medicodental problems than he could otherwise obtain. His hospital experience and the contact with his medical confreres will broaden his concept of the part that oral surgery can and must play in the care of the sick and the injured. His acumen will be enhanced as a diagnostician, enabling him to evaluate more readily the condition of his patient. As a result of this advanced training, dentists are qualified to practice oral surgery in a much wider scope than was formerly considered within the domain of dentistry.

Progress in the field of oral surgery and the increase in the educational requirements necessary to practice this specialty have brought about a somewhat complex interrelationship between medicine and dentistry. Oral surgery might be

considered as the connecting link between the two professions. With the increased educational requirements to qualify dentists in this field and the expansion of the practice of oral surgery, it is only natural that questions should arise as to the status of oral surgery in relation to the practice of medicine. The oral surgeon is primarily a dentist and not a physician. It is not his desire to practice medicine, but rather to practice intelligently a specialty of dentistry as covered by statute. Although the practice of dentistry and that of medicine are regulated by separate Practice Acts, some overlapping from one field into the other on occasion, is bound to occur. The goal of the dental practitioner is no different from that of the physician—both are striving to prevent disease, alleviate human suffering and prolong human life.

The closest cooperation between medicine and dentistry is essential to the welfare of patients. The cordial relationship between the two professions, which has existed in the past, will undoubtedly continue in the future; and the encroachment of certain specialties in medicine into the field of oral surgery need not be viewed with too great alarm. The main objective in the treatment of disease or injury is that the patient receive the best possible care—whether it be received from a physician or from a dentist is of secondary importance. The control of certain infections by newer forms of therapy has reduced the incidence of certain diseases that formerly comprised a large part of the practice of otolaryngology. Consequently, it is natural for those practicing this specialty to look toward other fields in which to exercise their arts. The adjacent field of oral surgery being, anatomically speaking, closely allied to the field of the otolaryngologist has stimulated some otolaryngologists to extend their practice into what for years has been recognized as solely a dental region. It is difficult to visualize anyone without a sound formal dental training, plus the type of graduate training oral surgeons now receive, being competent to practice oral surgery. The field of the otolaryngologist is expanding into newer channels well within the domain of medical specialties, and the well trained otolaryngologist of the future will follow this new development and expansion of his specialty more than he will try to enter the field of oral surgery for which he has not been trained. Consultation between the two specialties, however, is most desirable in cases of mutual interest.

Oral surgeons are not infrequently called on to treat various serious and complicated fractures of the maxilla which are associated with fractures of other cranial bones and which result in facial deformities that are beyond the field of oral surgery. Although oral surgeons may treat competently the maxillary fractures and lacerations, cooperation with the otolaryngologist, the neurosurgeon, the plastic surgeon, the ophthalmologist, the general surgeon, and various auxiliary services might be necessary in order that the patient receive the most skilled treatment possible.

Again, in the treatment of neoplastic diseases, the best results are obtained by teamwork on the part of a group trained in the treatment of such diseases—one which has the services of a competent oral surgeon available. A malignant lesion in the mouth may be primary or it may be

secondary to a lesion elsewhere, and the fullest cooperation between medicine and dentistry becomes imperative. To continue further, a malignant lesion that originates in the oral cavity may have metastasized to regions beyond the domain of the oral surgeon, and this possibility must never be overlooked in dealing with oral neoplasms. Consultation with medical men, particularly medical specialists, is desirable in such cases, and at times is the logical course to pursue if the patient is to be given proper evaluation and wise counsel as to treatment. The increasing incidence of cancer offers a direct challenge, not only to medicine, but also to dentistry; and dentists must accept the responsibility of materially aiding in the control of this disease, which is second only to heart disease as a killer. The oral cavity is readily accessible to inspection, and no one should be more competent to note and diagnose changes in it than an observing and well-trained dentist. Maintenance of oral health is the responsibility of a dentist, whether he is a general practitioner or a dental specialist.

As the expanding field of oral surgery and the higher educational requirements now needed are viewed, the farsighted vision of the members of the American Society of Oral Surgeons who, like Doctor Garretson, pointed the way for progress in this field, should not be forgotten; nor should the industry and vision of individual dentists, practicing as oral surgeons, who have done so much to further the progress of dentistry and aid the development of oral surgery be forgotten. It was through the efforts of the American Society of Oral Surgeons that a Board for Certification in Oral Surgery was founded in 1946. The Board of Oral Surgery, after a careful study of the requirements of the various medical specialty Boards which had functioned for several years, outlined a program for certification, and it is gratifying to observe the progress that oral surgery has made since this Board first functioned. The road of the Board has not been entirely smooth. Criticisms of its high standards have been many because of the lack of knowledge and shortsightedness on the part of some dentists. Such critics generally are men who have been successful in their own practice which, although narrow in scope, nevertheless fulfilled the requirements of their particular locality. It is difficult for some oral surgeons to realize the changing concept of practice that has taken place in the past few years and the need for a different type of training to meet the added responsibility that goes with the newer and broader scope of oral surgery. The Board, however, has maintained the attitude that to qualify for certification as oral surgeons, men should have a solid fundamental training and not be merely skilled technicians. It is most gratifying to the members of the Board to observe the higher educational level of recent applicants for examination. Those who have fulfilled the requirements of the Board as to basic science studies and hospital training have little trouble in obtaining passing grades. They are the men who will guide the destiny of oral surgery in the years to come.

Oral surgeons, however, in their enthusiasm for the future progress of oral surgery as developed by dentists limiting their practice to the specialty, should not overlook the part that the general practi-

tioner may play in furthering the progress of dentistry in relation to oral surgery. The general dentist is the backbone of the dental profession. Certain communities cannot support a highly trained specialist in oral surgery, and much of the oral surgery in such communities must be done by general practitioners with the more complicated cases being referred to a specialist. Those dentists who have not had the opportunity for advanced formal training can, with additional study such as attendance at round table discussions, seminars, and special study groups, prepare themselves to care adequately for much of the routine oral surgery of everyday practice. They should familiarize themselves with hospital procedures and hospital operating room technic in order to conduct themselves properly in an atmosphere somewhat different from office routine.

Hospitals exist for the care of the sick and the injured, and dentists should avail themselves of hospital facilities wherever necessary in order to care adequately for their patients. Too often, lengthy and complicated surgical procedures are attempted in the dental office because the dentist, who is unfamiliar with hospital procedures, is reluctant to avail himself of the opportunity to operate in a hospital. Patients suffering from serious cardiac disease, for example, are always a surgical risk and should not be subjected to complicated operations in an office. Local anesthesia, valuable as it is because of its simplicity, often tempts a dentist to go beyond his ability as a surgeon and causes him to underestimate the effect of a dental operation on a patient who is a poor surgical risk. Such patients deserve proper preoperative evaluation and postoperative care and rest.

Dentistry has grown up and reached maturity, and the wisdom of the mother profession, in spite of periodic criticism, has been reflected in the growth of its first born specialty. The continued progress of oral surgery is assured and the future of this specialty is bright because dentists will continue to receive better fundamental training and render more skillful and adequate care of those who seek and require their services. The progress of oral surgery to its present enviable position can be credited to the enthusiasm and leadership of dentists whose vision reached far beyond the four walls of a dental office. It must not be forgotten, however, that progress is never static. Improved methods of obtaining anesthesia together with a better understanding of the action of newer anesthetic agents have opened the door for advancement in surgical technic to the extent that almost any part of the body is now available for surgical exploration and procedure.

As the field of general surgery has expanded, so, likewise, have the various surgical specialties. It is only natural that oral surgery, too, will continue to expand and embrace a wider field. To do this, oral surgeons must realize that there are principles underlying life and progress, and those who are to succeed must abide by those principles and have faith in those principles and work earnestly to lay a solid foundation on which to build and expand to reach the goal of perfection. The present program in graduate education is designed to prepare dentists to attain this result in the field of oral surgery

as a specialty of dentistry; and as the field of oral surgery broadens and develops, so, also, will the concept of dentistry as a health service be broadened. As dentists specializing in oral surgery reach higher levels of service, so, too, will general practitioners of dentistry improve their skills and knowledge to render better service in the communities which they serve.—*269 South Nineteenth Street.*

Surgical aids to intraoral prosthesis

■ *J. Orton Goodsell, D.D.S., Saginaw, Mich.*

Prosthetic art aims to supply functional or esthetic portions of human anatomy which have been lost or which are congenitally absent. Any device which is to be worn in an orbit, on a leg or in the mouth, depends on the foundation upon which it rests for its success. A denture can be no better than its base. Many mouths, at first glance, seem to present insurmountable difficulties to the satisfactory insertion of dentures. Great numbers can be improved, however, if the prosthodontist is fully aware of the surgical aids that are available and utilizes them. Many dentures which are worn with discomfort or annoyance can be made comfortable or nondistracting, if surgical alterations are utilized. Many impossible situations can be made partially tolerable or esthetically acceptable.

The normal or ideal mouth must: (1) provide adequate bony support for the dentures; (2) have the bone covered by normal soft tissue; (3) present no undercuts or overhanging protuberances; (4) have no sharp ridges; (5) have adequate buccal and lingual sulci; (6) have no scar bands to prevent normal seating of a denture at its periphery; (7) have no muscle fibers or frenums to mobilize the prosthesis; (8) possess satisfactory relationships of maxillary and mandibular alveolar ridges; (9) contain no soft tissue folds, redundancies or hypertrophies on the ridges or in the sulci; and it must, of course, (10) possess no neoplasms.

If the partially or completely edentulous mouth is normal or ideal in its contours, no surgery is required. But if surgery is required it is unwise to fail to employ it.

It is the purpose of this presentation to illustrate some of the causes of prosthetic failure and to suggest and describe a few surgical methods for correction.

The general principles of surgery apply here as in other surgical fields. The judicious choice of anesthesia, relative

asepsis, supportive treatment, sedation, antibiotic use when indicated, nutrition and fluid balance, and consideration of the physical status of the patient are important. The principles of plastic surgery also must be adhered to in the use of intraoral plastic procedures. Hemostasis, preservation of blood supply, lack of excessive suture tension, prevention of hematoma formation by pressure dressings and appliances merit detailed attention.

As an introduction to the description of specific procedures, a few accepted principles and technics which have proved applicable to many intraoral, plastic operations are worthy of mention.

Tissues should be gently, yet boldly, handled. Sharp knives, fine skin hooks or tenacula, small, mouse-toothed tissue forceps and nonabsorbable suture material of fine diameter on atraumatic needles are included in the general armamentarium.

The movement of full-thickness, mucous membrane flaps and the relief of lines of tension are necessary frequently if an adequate sulcus is to be established for the reception of a prosthesis.

Incisions must be sharp and at right angles to the membrane surfaces (Fig. 1). Their depths should be equal on both of the margins that are to be approximated. Precise undermining, in sufficient amounts to allow edge to edge approximation without excessive suture tension is essential.

The elimination of scar bands, tight frenums or abnormal muscle fasciculi can be accomplished in one of several ways. The "V-Y" (Fig. 1, #2) method involves sharp "V" incision through the full thickness of the mucosa, undermining of the membrane and the shifting of the "V" in a direction which transforms the final pattern into a "Y" and releases the line of tension. An incision across a line of tension, followed by undermining and the creation of a "diamond" (Fig. 1, #4) which is made by using skin hooks to pull one edge upward and the other edge downward, can also dispose of contraction. With the hooks held in place, crosswise sutures are inserted as retainers. The "Z-plasty," (Fig. 1, #5) when employable, probably is the best procedure for the elimination of contractures or similar deformities.

An incision on the crest of the band through the full thickness of the membrane initiates the procedure. Two lateral incisions, ideally at an angle of about 45 degrees from the original line, one on each side of it and parallel to each other, likewise are carried to the base of the mucosa. Adequate undermining, transposition and interpolation of the angular flaps plus suture retention will change the direction of the distorting forces to one which is at approximately right angles to the original tension line. If a linear cicatrix is present it can be removed in its entirety and the long axis of the "Z" be thus created. If the contracting force covers a surface which is too long to be solved by a single "Z," multiple "Z's" may be effective. This is done by using one long incision as the central member and making additional lateral incisions from this line as is described in the construction of a single "Z." These additional angular flaps then are transposed, inserted and sutured in place.

Variations of Burow's method (Fig. 1, #3) for the covering of membrane defects without grafting occasionally may be employed to advantage. The amount of

slide is limited by the size of the defect and the amount of normal mucosa that is available; however, oral epithelium is abundant and loose so that large areas frequently can be covered in one or more stages without destroying the grooves in which the prosthesis is to rest. The method can be used as a preventive procedure at the time of any surgery or may be corrective when indicated. The flap is outlined, sharply incised, undermined and slid over the bare, clean defect. Excess folded tissue is excised (at the site of the shaded triangles) and the margins are retained by sutures.

Occasionally two margins which are to be approximated vary in length (Fig. 1, #6). They can be made equal by widely undermining the long side at one end and then pulling over the excess tissue and excising it.

Haphazard suturing should be

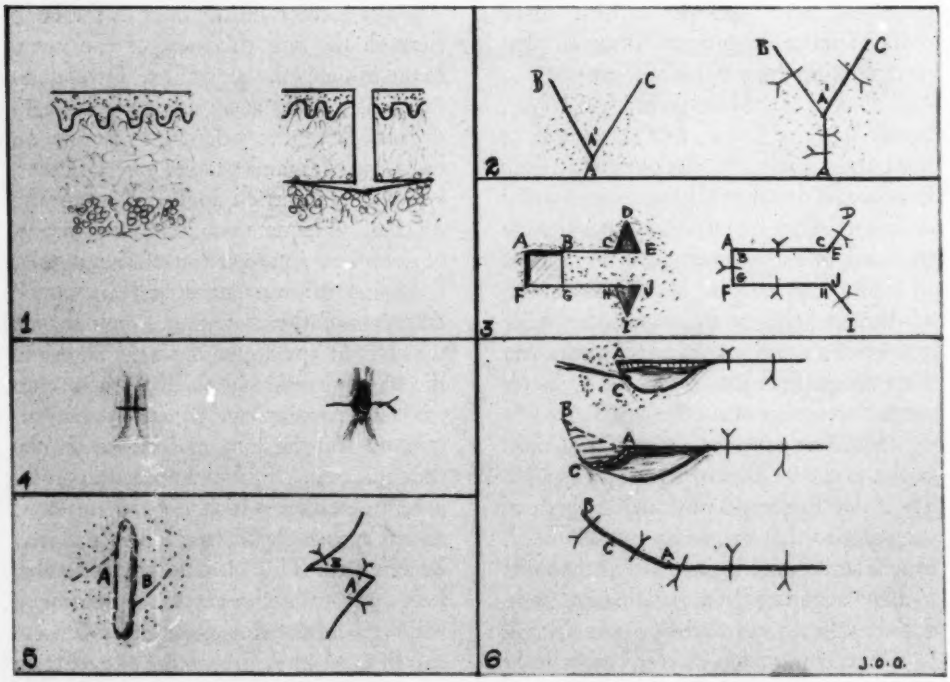

Fig. 1—#1: Illustrates the use of sharp margins, undermining, and the equality of thickness of mucosa. #2: "V-Y" technic showing undermining and shifting upward of A' to its new position. #3: Burow's method for covering membrane defects. Dotted surface is undermined region. Shaded triangles are tissue to be excised. #4: "Cross-diamond" incision with one edge raised, the other lowered, and a horizontal suture in place. #5: "Z-plasty." Scar excised and triangular flaps A and B produced. Dotted undermining. Flap A is swung to the right and down. Flap B is swung to the left and up. Both are sutured in their new positions. #6: Shows the equalization of unequal sides. A skin hook is placed at C, and, after undermining, it is retracted and the tissue enclosed by A-B-C is removed. Suture retention then follows

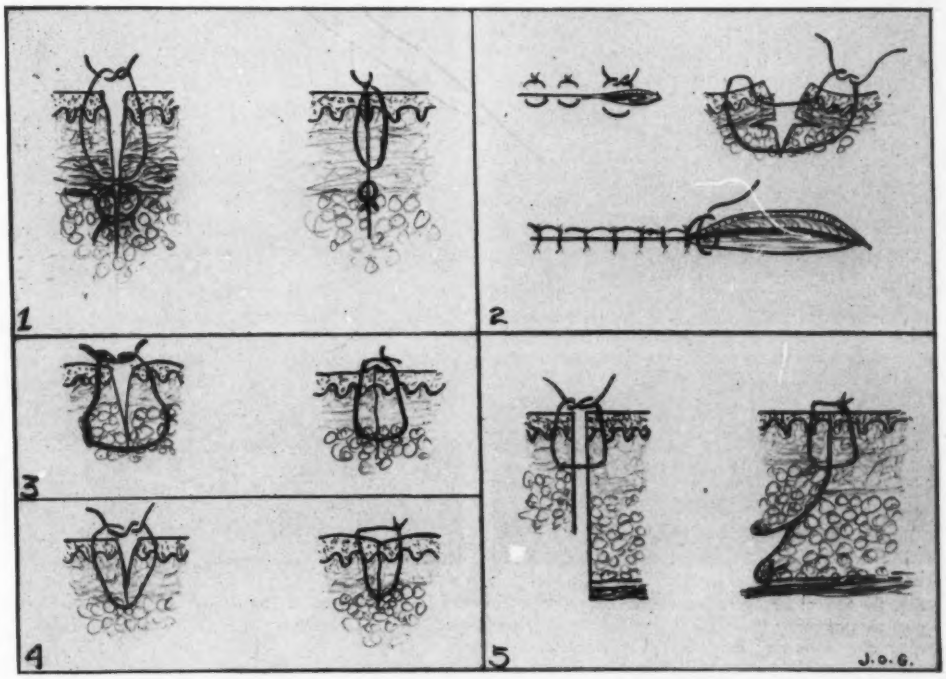

Fig. 2—#1: Support of deep layer by buried suture. #2: Horizontal, vertical and continuous mattress sutures. #3: Suture position to produce eversion of skin edges. #4: Suture position for edge inversion. #5: Skidding of deeper layers and suturing to support unsupported side and prevent depression or invagination of superficial layers

avoided. A few additional general principles are also worthy of description (Fig. 2). If an incision or laceration is deep, the layers of subepithelial tissue should be closed in layers and be retained by fine absorbable sutures to provide the mucosa with adequate support. If there is inequality in thickness of the deeper tissues, it may be possible to relax them by sharp dissection and to slide one side under the deficient layers of the opposite member in order to support its external surface (Fig. 2, #5). A superficial suture which is placed in such a position that the deeper portion is more widely extended than the upper will tend to evert the edge of a suture line (Fig. 2, #3). Conversely, inversion will occur if the narrow portion is at the base (Fig. 2, #4). Normally, eversion is preferable. Vertical, horizontal and continuous mattress sutures have their uses and provide both excellent support and good eversion of the wound edges (Fig. 2, #2).

■ *Sharp Ridges*

Extremely sharp, edentulous alveolar ridges may be revealed by heavy palpation or by the patient attempting to wear dentures. Razorlike or sawlike ridges are

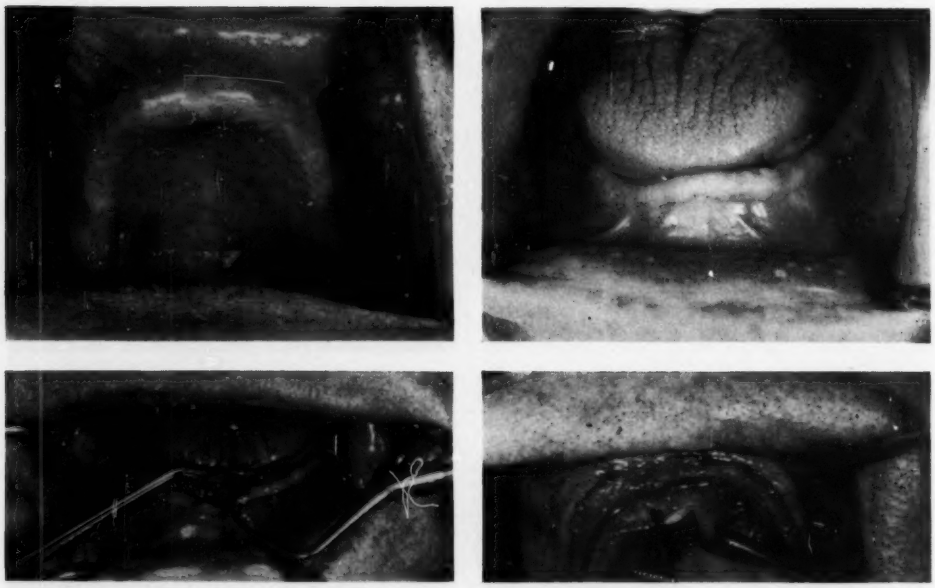

Fig. 3—Above: Preoperative views. Below left: Exposed lower ridge, with the thumb forcep tip on lingual side of sharp bone. Note slight amount of periosteal reflection. Below right: Maxillary alveolar ridge, after elimination of irregularities of contour

among the most frequent and serious causes of denture discomfort. Patients frequently go from one dentist to another in an effort to obtain dentures which can be worn comfortably. The prosthodontist may construct new dentures in the hope of satisfying the patient, usually with no more success than previously until it is decided that sharp ridges are at fault. When these conclusions are reached the remedy becomes simple. Surgical correction of the sharp alveolar ridge followed by construction of new dentures usually is productive of comfort.

Many times the clinical observer may be deceived into believing that the bony ridge is satisfactory because the soft tissue covering is well rounded, obscuring the fact that a very sharp ridge is present beneath the mucoperiosteum. Firm finger pressure is required to elicit the typical discomfort experienced with sharp ridges, but usually the patient can point to the offending areas himself. It is of prime importance to employ surgery where it is needed and not to evade the issue by building new equipment which cannot be worn with comfort. The following example is a case in point and is not uncommon.

REPORT OF CASE—A patient complained of being unable to wear his dentures while eating. He had had four sets of dentures constructed by different dentists. All had been unsuccessful and had caused discomfort while eating. He was critical of the dentists who had served him previously and was doubtful about

the suggestion of his new prosthodontist for surgical correction of the alveolar ridge. Nevertheless, he decided to make one more effort. Examination of the mouth, without palpation, did not reveal, except possibly on the mandible, anything at variance with what could be expected in one who had been edentulous for several years (Fig. 3, above). Moderate finger pressure on the crests of the ridges in the upper anterior area and over most of the lower ridge produced pain. The process of mastication apparently compressed the mucoperiosteum against the sharp ridges of bone and the act of occlusion therefore was painful. This condition had prevailed during most of his denture experience.

It is to be assumed that each time new appliances were made the patient's dentist attempted to relieve the offending pressures by placing the bearing points buccally and lingually to the alveolar crests. The reason for this assumption is that at first he was comfortable in each instance, but as time elapsed his discomfort returned. This is compatible with the known fact that bone will absorb if subjected to excessive pressure at any point. It would seem that the dentures must have moved toward the old, high, rough crests until these became, once more, the central support of the dentures. When this occurred the pain returned. Surgical correction of his problem was simple (Fig. 3, below).

A sharp incision through the mucoperiosteum over the area to be exposed, slightly toward the labial or buccal side of the crest, was made. The periosteum was reflected only

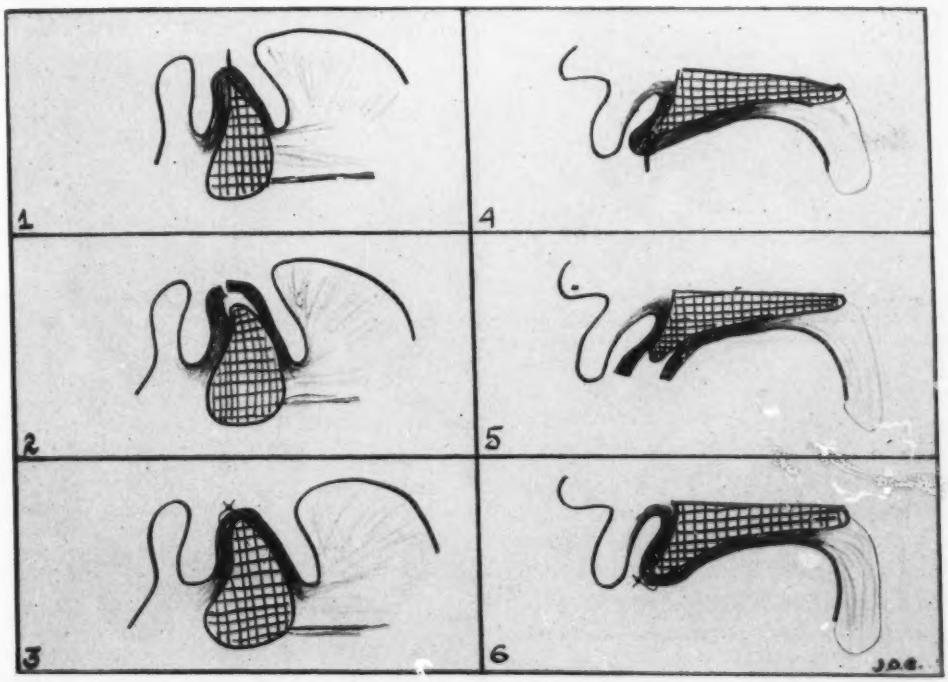

Fig. 4—Position of incision, sharp ridges, extent of bone trimming, amount of periosteal reflection, and utilization of palatal or lingual flaps to cover bony ridges

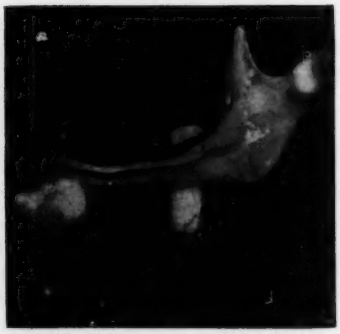

Fig. 5—Dry specimen of atrophic, edentulous mandible which reveals a sharp mylohyoid ridge. Note flat superior surface and long, sharp spine which extends from retromolar region forward throughout most of the mandibular body

enough to bring the bone into adequate view. This is extremely important if the already shallow buccal or labial sulci are to be preserved. It is safer to reflect the lingual or palatal periosteum than that on the labial or buccal side, but the less that it is undermined on either side, the better. Rongeur forceps, bone files or large burs were then employed to dispose of the irregularities and to level off the sawlike protuberances. Just enough bone should be removed to provide a smooth alveolar process, and no more. In some cases when the soft tissue is approximated, it is necessary to excise a millimeter or two of soft tissue along the wound edges if an excess is present. The mucosa from the lingual side provides a good ridge covering if it can be so positioned (Fig. 4, #3 and #6). Closure of the wound is best

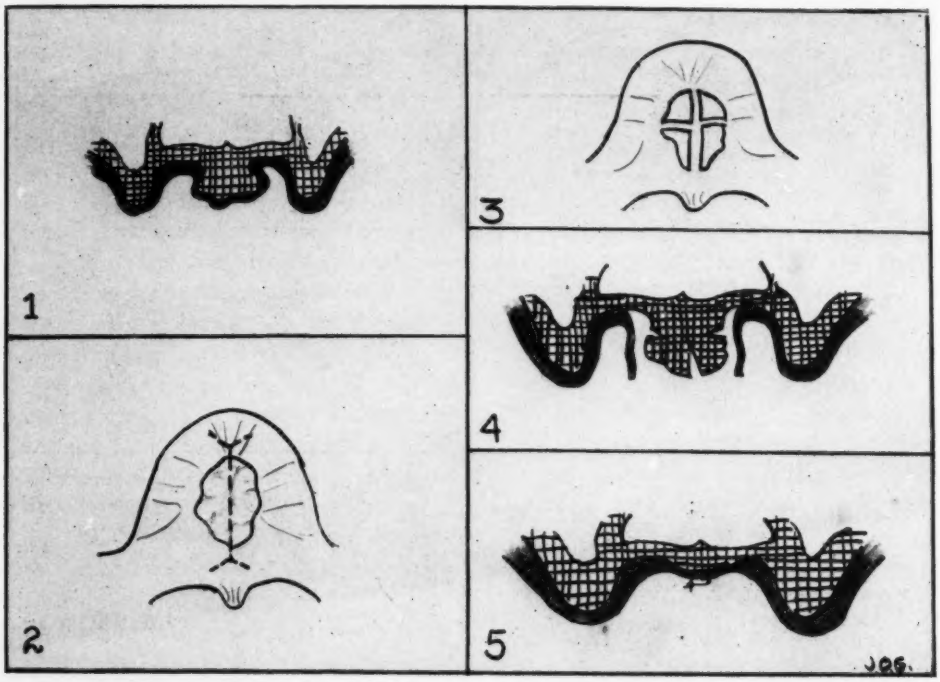

Fig. 6—#1: Cross section of torus palatinus. #2: Dotted incision line. #3: Division of torus into segments. #4: Lateral grooving of mass at its base. #5: Sutured

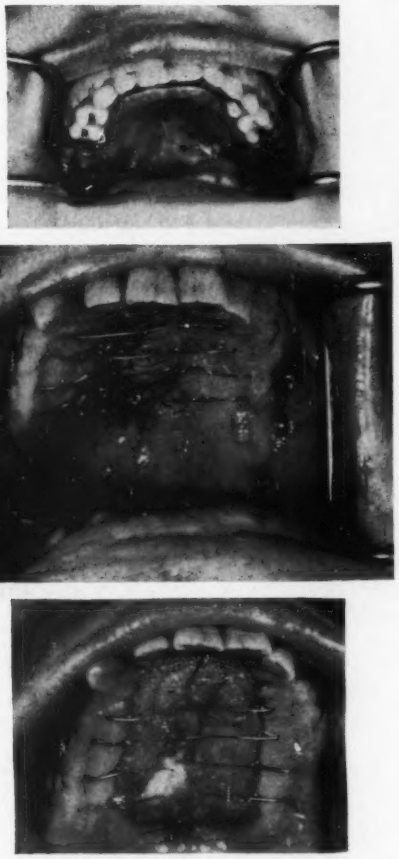

Fig. 7—Above: Acrylic vault support consisting of a palatal section which is attached to a buccal and labial flange in the distal areas by clasp material around the last teeth on each side. Labial flange is divided in the midline and is retained by wires across buttonlike projections after the appliance is inserted. This latter feature does not show but is under the upper lip. Center: Crisscross stainless steel wire gauze support, prior to insertion of pack. Below: Gauze support inserted. It is tied to incisors with silk suture. The wire has been compressed superiorly

accomplished by utilizing fine, nonabsorbable, no. 0000 or no. 00000 suture material on atraumatic needles, to suture the mucosal surfaces together accurately. Additional tissue support can be obtained by immediate insertion of the patient's old dentures which should be lined with surgical cement. The patient discussed herein is now able to wear his dentures at all times without discomfort, and as a result he has an improved opinion of dentists and dentistry.

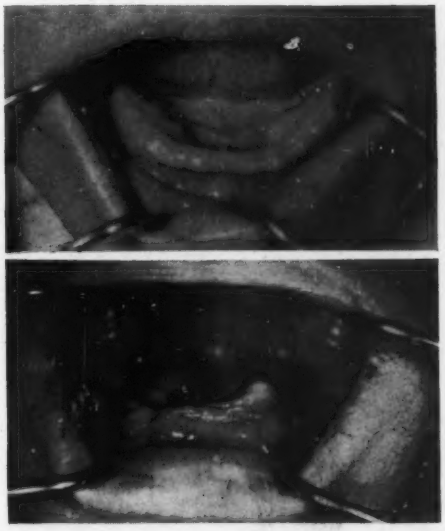

Fig. 8—Above: Lingual mandibular tori which should be removed prior to preparation of lower denture. Below: Result of an attempt to circumvent mandibular tori without resorting to surgery. Elevations are tori which once were well below the denture that had been placed around them

Sharp mylohyoid ridges are infrequent offenders, but they can be bothersome to the wearer of lower dentures and at times contouring reduction may be needed (Fig. 5). The same principles of retention of the buccal sulcus as mentioned previously should be kept in mind if surgical intervention is attempted. The originating incision is made along the crest of the ridge extending from the retromolar region forward as far as necessary. The mucoperiosteum on the lateral

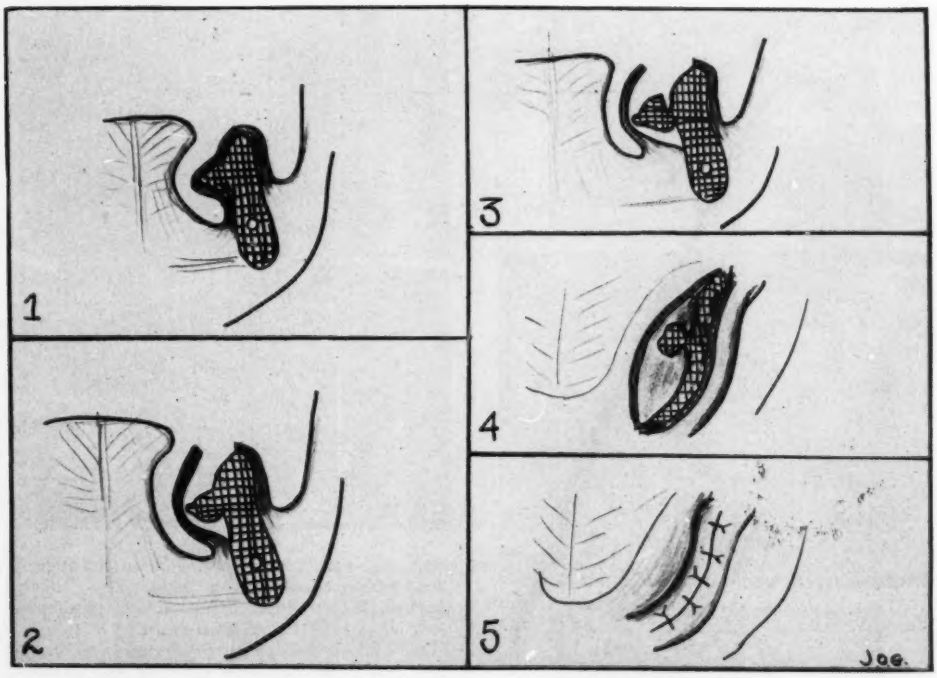

Fig. 9—#1: Cross section of mandibular torus. #2: Lingual periosteum reflected, exposing torus, but leaving the lateral periosteum attached. #3: Superior grooving on torus. #4: Mesial and distal troughs through the cortex. #5: Incision sutured.

Relative position of the mylohyoid muscle insertion into lower portion of body of mandible is shown by the horizontal lines in #1, #2 and #3

side should not be reflected. It remains to serve as a fixed anchor to which the lingually raised periosteum can be sutured. The fibers of the mylohyoid muscles that are attached to the sharp bony crest then are dissected away, but only enough to obtain access to the bone which is smoothed with burs, chisels and rongeur forceps. Approximation by suture of the lingual flap to the fixed buccal side will draw up the soft tissue so that it is in tight contact with the medial surface of the mandible and thus the formation of a hematoma is prevented.

■ *Tori*

Maxillary or mandibular tori have no pathologic significance and ordinarily need no surgical attention. Removal is indicated if they become traumatized and the membrane surfaces become hyperkeratotic, or if inflammatory processes occur as a result of debris retention under their folds and projections. Their excision is essential in many instances when they fall within the required covering range of dentures.

Palatal tori vary in size and shape.

Many are small and some are large. Some are multilobular with wide overextensions on narrow bases, while others are more or less sessile. Usually the muco-periosteum is very thin over the rounded projections, whereas it is thicker as it overlies the periphery of the base. The main problems involved in the removal of palatal tori are those presented by the lobulations and the thin mucosa (Fig. 6). Caution must be observed when the bony portion is removed.

The torus should not be excised en masse because occasionally the nasal floor dips downward in the area so a perforation into the nose may be produced if too large an area of bone is lost. A difficult soft tissue closure would then be required, needlessly. Division of the torus into segments can be accomplished by burs and the smaller pieces eliminated with chisels and rongeur forceps. Large surgical burs and files serve very well as instruments in the final preparation of the surface. Smooth burnishing of the bone should be avoided.

After the torus is reduced there is an excess of soft tissue which must be trimmed from the approximating medial edges. After this is done the wound is sutured, preferably by a continuous "over and under" type suture using fine Dermalon on an atraumatic needle. The thin membrane does not endure the passage of heavy needles.

In order to preserve the life of the flap and prevent hematoma formation, it is essential that it be supported against the palatal vault. The freshened, bony

Fig. 10—Left: Prognathism in patient who has been edentulous for several years and has been unable to tolerate functional dentures. Below left: Profile roentgenogram of same patient showing relation of maxillary and mandibular anterior alveolar ridges and revealing a narrow, atrophic mandible which would be difficult to set back without risk. Below right: Anterior intraoral view of same patient

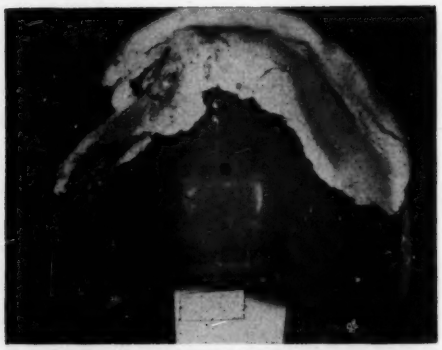

Fig. 11—Patient's old denture with surgical cement flange added for the purpose of immobilizing labial sulcus flaps after removal of redundancies

base furnishes serous exudate as nourishment for the thin membrane. Actually the treatment is not unlike that for the application of a free graft. Compression of the tissue reduces the incidence of venous stasis and future necrosis.

A clear acrylic vault support (Fig. 7, above) is useful, particularly when teeth are present in the anterior portion of the mouth and not in the molar areas. The appliance is prepared preoperatively, and after suturing is completed it is inserted into the mouth and petroleum jelly type gauze is packed between it and the palate in sufficient thickness to insure adequate pressure against the roof of the mouth. Sulfanilamide powder is sprinkled between the layers of the gauze. The appliance should be left in place without disturbance for a week.

If teeth are present in the molar regions, the flaps can be supported by gauze placed under a cradle which is constructed by crisscrossing the palate with wire that has been passed through and around the posterior teeth. The gauze can be tied to the front teeth or sutured to the anterior soft tissue. Excess gauze may be trimmed off posteriorly. The wire should be stiff enough to retain pressure against the pack as it is pressed upward by the surgeon's fingers. This type of retainer also should be left in place for about a week before removal. When an

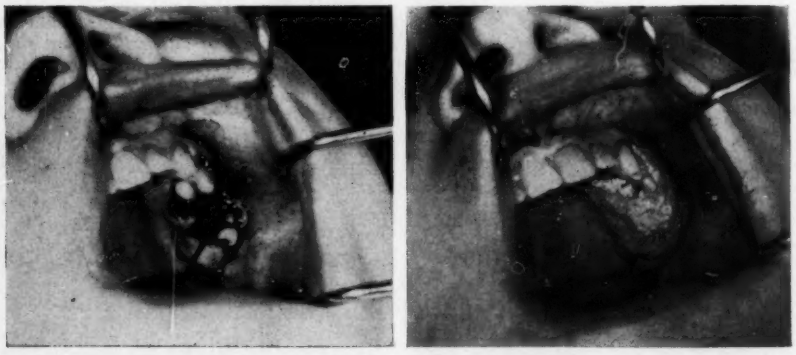

Fig. 12—Left: Wire figure 8 running between bicuspid and cuspid and through fibrous tuberosity to act as retainer for surgical cement. Right: Benign tumor had been removed leaving a broad base which could not be covered by buccal mucosa without destroying buccal sulcus

acrylic appliance is not at hand and there are no molars present, the cradle may be inserted by passing the wire through the ridge mucoperiosteum instead (Fig. 7, center and below). More discomfort is experienced by the patient, however, if this maneuver is followed than if teeth are present for wire attachment. Therefore, it is advisable, if the patient's molars and bicuspids are to be removed, to dispose of the torus before the teeth are extracted.

Mandibular tori, when present, occur primarily in the zone lingual to the bicuspids (Fig. 8, above). Removal is essential to future denture comfort if the area is to bear a prosthesis. Although these tori may be lower than the inner flange of a newly constructed denture, the appliance encroaches on them as alveolar atrophy occurs. Any attempt to circumvent the tori is almost certain to result in denture failure (Fig. 8, below).

The removal of mandibular tori is not complicated but a few suggestions may be worth while (Fig. 9). The incision over the ridge crest should be sharp and extend through to the bone. If the lateral periosteum is not reflected, the buccal sulcus will not be lost and a fixed anchor can be maintained to which the lingual mucoperiosteum can be attached later. There is greater danger of the development of a postoperative hematoma than in operating on a sharp mylohyoid ridge, since, in the bicuspid area, the mylohyoid muscle is relatively low in the floor of the mouth and a defect which will accept blood can develop easily if the lingual flap is loose and is not forced against and held closely to the lingual aspect of the mandible.

After the mass is exposed, troughs can be cut by burs in the superior and mesial and distal aspects of the bony pro-

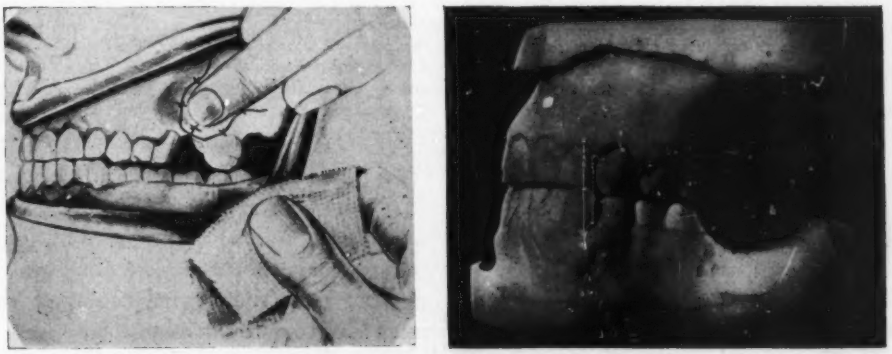

Fig. 13—#1: Flap which has been raised from buccal mucosa to cover oroantral fistula that is too high to be covered by a palatal flap, and that is now sutured into place. Prevention of buccal sulcus loss and insurance of adaptation of the flap to a concave base is accomplished by modeling compound pressure. #2: Modeling compound on plaster model illustrating method of holding mucosa against concave base. Compound is inserted as a "bite" impression and is molded against the flap and also against inner surfaces of teeth. Intermaxillary wire or rubber band ligation (not shown here) will keep teeth in occlusion and aid retention of support. At least four days of stabilization should be maintained

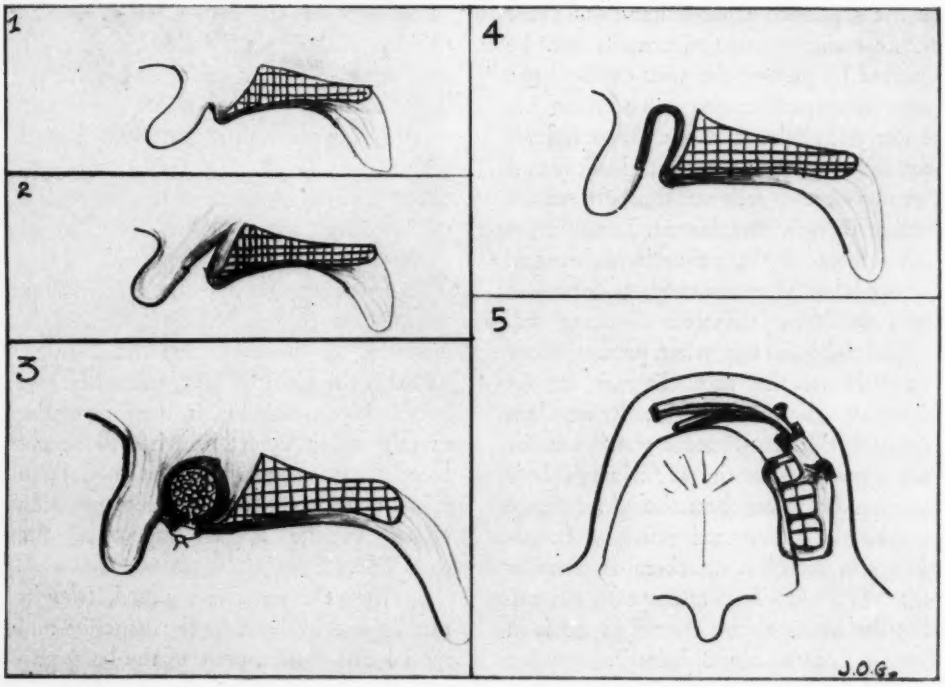

Fig. 14—#1: Shallow labial sulcus. #2: Sharp incision, creating cavity of desired depth for labial flange of denture, over the periosteum. #3: Modeling compound stent impression with splint skin over it and sutured into the cavity. #4: Support removed and margins trimmed. Ready for permanent sulcus retainer. #5: Square, forked wire inserted into female square tube which has been soldered onto metal cast that is now cemented about the teeth. Wire can be removed and the modeling compound placed about it prior to obtaining an impression of the cavity. After the graft is wrapped around the compound the square wire is inserted into the tube and held there by wire which is fastened to two hooks, one on the cast and the other on the tube. The rest of the procedure is as previously described

tuberance. A sharp blow on a chisel from above will fracture off the torus. Files and larger burs are utilized to smooth the bony wound. Irrigation and suction will dispose of the bone dust and debris from the depths of the cavity. An excess of lingual flap will need to be trimmed away at its edge prior to approximation by suture and fixation to the immobile lateral mucoperiosteum. The employment of a denture-type tissue support is of no particular aid in such circumstances since the location of a potential hematoma is too far below the rim of an appliance to allow the retainer to be effective. The secret of success is to keep the periosteum in close contact with the lingual aspect of the mandible by suture methods.

■ *Mandibular Prognathism*

Ordinarily maxillary protrusion is corrected easily by extensive alveolectomy. Furthermore, the protrusion may be relative; that is, it is accentuated by man-

dibular retrusion. The micrognathic mandible seldom requires surgical division and advancement prior to the time when a prosthesis is needed. It is not uncommon, however, to see patients with mandibular prognathism who should have correction of the deformity by osteotomy or ostectomy if prosthetic appliances are to be constructed. It is impossible in many instances to perform a mandibular alveolectomy which would move the lower anterior arch far enough lingually to permit functionally and esthetically satisfactory denture construction.

Orthodontic treatment is limited in effectiveness in these cases, but orthodontic consultation and assistance are nearly indispensable in the planning and

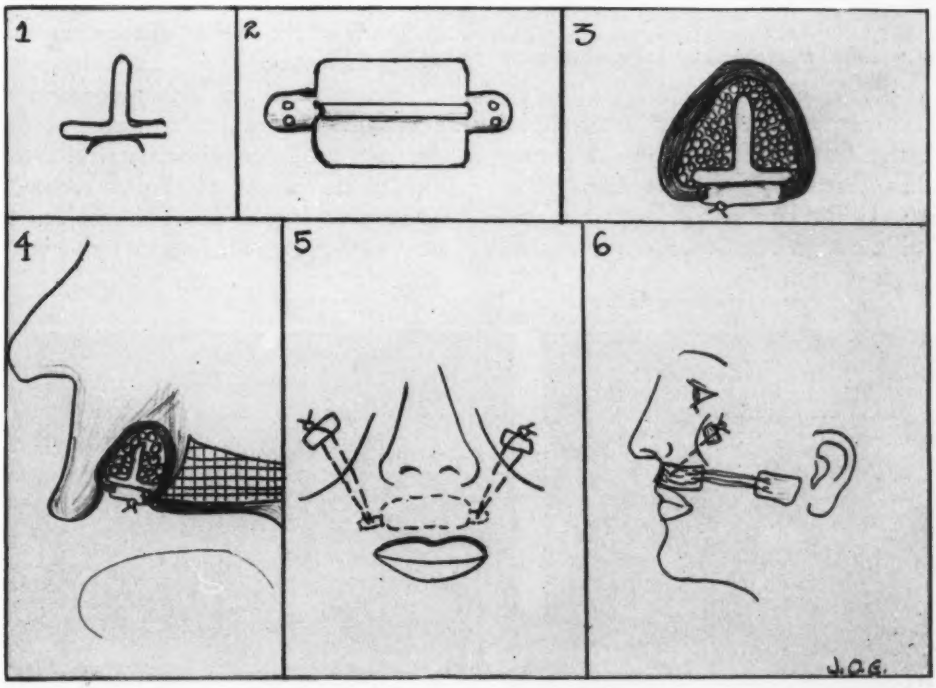

Fig. 15—#1: Cross section of aluminum framework for holding modeling compound. #2: Top view of the aluminum retainer for compound. This is contoured and trimmed from a flat piece of aluminum sheet. #3: Soft compound is wrapped around the aluminum and impression of the cavity is obtained. The graft is then wrapped around the compound with perforated flanges of metal extending outside the skin graft. Surface of compound is wiped with petroleum jelly and edges of graft are sutured together to hold split skin about stent. #4: Cross section of graft, compound and metal in place. #5: Graft in place, retained by sutures which emerge on the cheeks and are tied over shreds of gauze. Intraoral attachment is to the perforated lateral flanges. #6: External lip stabilizer which is tape over roll gauze or mechanic's waste. Hooks are attached to lip tape and also to adhesive tape on cheeks. Rubber bands may be used between hooks to produce moderate pressure. Elastic type adhesive bandage usually serves more efficiently than does this complicated pressure device (see Figure 16)

Fig. 16—Elastic adhesive type bandage over several layers of gauze, providing external support for intraoral, lower, labial stent. Larger masses of gauze or mechanic's waste than here shown are necessary

treatment of mandibular prognathism. Either maxillary or mandibular protrusions, if marked, may have a serious psychological effect on the individuals who possess them. When dentures are needed, functional loss is added to the other problems. If all teeth are present and in good condition, surgical correction of the mandible alone suffices for the prognathic individual.

Prosthetic restoration is required if the protrusion is premaxillary and upper teeth are lost or if the mandibular teeth are absent or demand removal. Teeth have two purposes—use and appearance. If they are not in functional occlusion and if they detract from the dental harmony or beauty of the individual they may as well be absent.

Experienced prosthodontists are well aware of the difficulties encountered in the construction of satisfactory full dentures for the patients who possess extreme mandibular prognathism. The problem is never-ending for the patient who tries to

Fig. 17—Above left: Fibrous hypertrophy of tuberosity-molar region. Above right: Roentgenogram showing descent of upper molars with closure of intermaxillary space. Below left: Postoperative view of patient after removal of molars, reduction of tuberosity and surgical relief of flabby hypertrophy over lower edentulous molar region

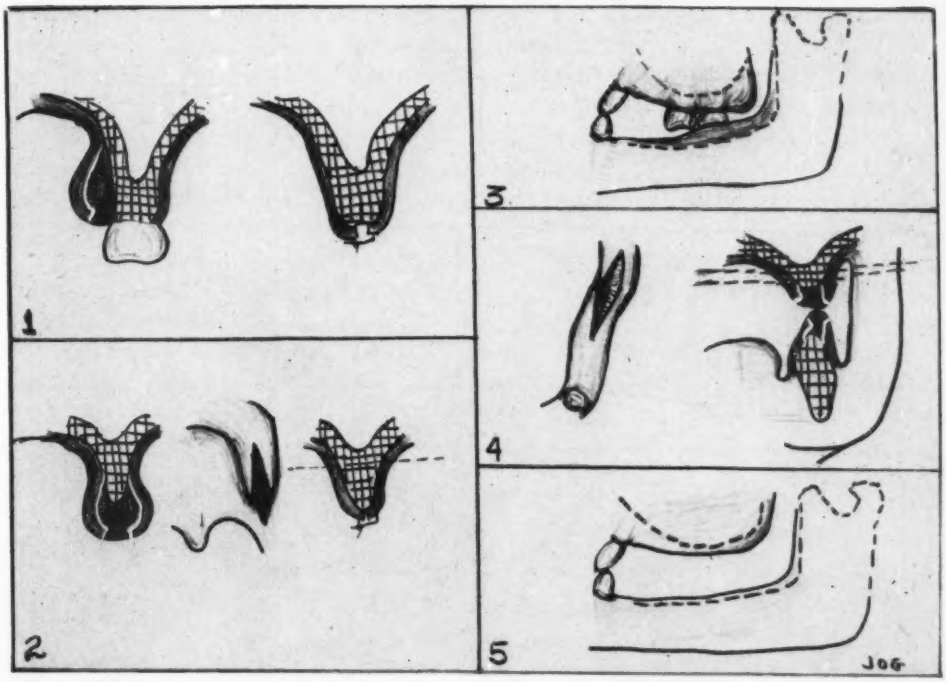

Fig. 18—#1: Fibrous hypertrophy in molar region on palatal side. Periosteum, including the complete mass, should be reflected palatally. With sharp dissection, leaving mucosal surface intact, fibrous tissue is reduced on bony side. This flap is then laid over the ridge and sutured to the buccal side. #2: A wedge-shaped section is removed in the amount required and, in the same manner as in #1, the mucosa is left intact while removing additional fibrous tissue not delivered by the original wedge. #3: Molars in occlusion with excess soft tissue on lower ridge; fibrous tuberosity. #4: Section of tissue removed from lower ridge. Reduction of molar region bone and fibrous tuberosity. Only limitation to amount of upward reduction is maxillary sinus. #5: New space which has been created

wear upper and lower dentures when the symphysis region and ridges are far anterior to the premaxillary opposition. In many instances the dissatisfaction of the patient and the dentist can be avoided if pre-extraction appraisals are made. If the individual is so prognathic that future dentures will inevitably fail, surgical correction by osteotomy or ostectomy becomes a necessary prelude to the intraoral prosthetic correction. A reluctance to

Fig. 19—Flabby soft tissue over lower anterior alveolar ridge

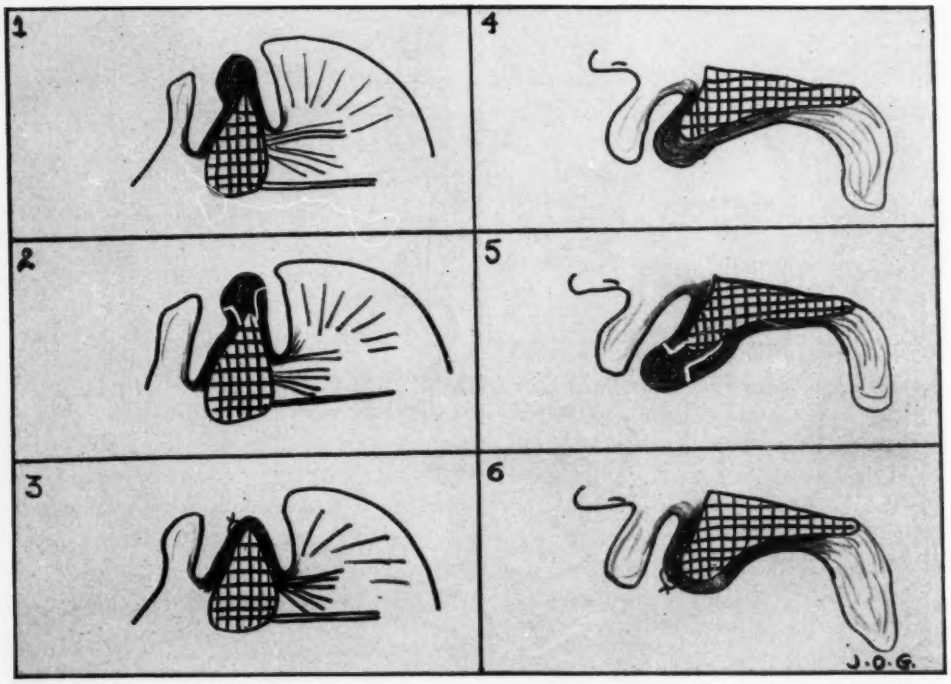

Fig. 20—#1: Cross section of soft, mobile, lower ridge covering. #2: Section to be excised and discarded, leaving long flap from lingual side to cover crest. Note that no periosteal reflection is permitted and that the sulcus depth remains as it was preoperatively. Numbers 4, 5 and 6 are the same as 1, 2 and 3 except that they are maxillary

recognize this and act accordingly can produce much unhappiness.

Many different types of operations have been employed to set back the body of the mandible. The various technics need not be described here. If extraction of teeth and prosthetic reconstruction are necessary, it is best to do the surgical correction prior to complete extractions in order to permit the use of teeth for immobilizing splint attachments. Mandibular atrophy, after prolonged attempts at wearing dentures unsatisfactorily, may eliminate the opportunity which once existed to set back the body of the mandible. Surgical judgment may dictate that a corrective procedure no longer is desirable (Fig. 10). Possible nonunion of bone after surgical division of the mandible may become a hazard which should not be risked. At best, an extremely difficult surgical task would confront the surgeon, whereas a pre-extraction operation might have been simple. Here again, the principle of avoiding unwise circumvention is important.

■ *Soft Tissue Deformities*

Intraoral soft tissue deformities frequently interfere with the proper seating

of dentures. Flabby or wobbly ridge coverings, whether they are densely fibromatous or the softer, more redundant type, provide an unstable base. Excessive atrophy in the ridges of either arch causes partial obliteration of the bony foundation with resultant loss of labial or buccal sulci. Fibrous bands, tight muscle attachments or scars mobilize dentures and prevent stability. In many instances soft tissue alterations which produce interference are traumatic in origin. Dentures which have been worn too long without adjustment are the chief offenders. The removal of teeth sometimes produces cicatrices which may obliterate the sulcus.

Massive ulcerative stomatitis can produce scars about the cheeks and jaws; and electrical burns, automobile accidents and gunshot wounds may produce the

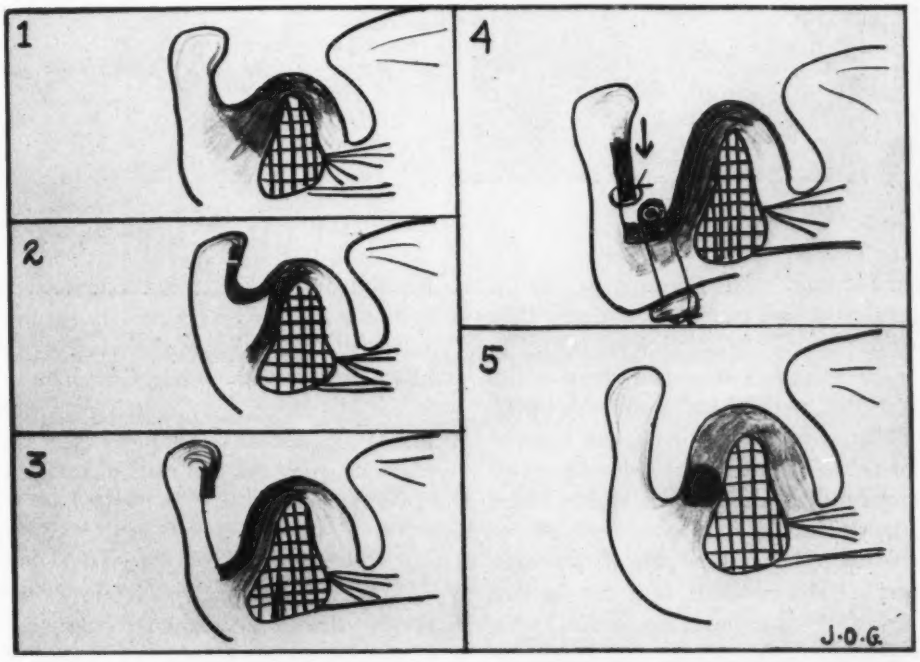

Fig. 21—Kazanjian operation. #1: Cross section showing loss of lower labial sulcus. #2: Full thickness dissection of sulcus mucosa and incision over the periosteum along anterior surface of mandible for insertion of flap. Incision through mucosa extends around the arch of the sulcus as far as is necessary. Position of mental nerve fibers must be considered in both incisions. #3: Flap in position, supraperiosteally, in cavity created by vertical incision. #4: Cross section showing flap retained in base of cavity by means of catheter which is held in place by sutures that emerge under the chin and are tied over catheter and gauze fragments (see also Figure 22, above right and below). Polyethylene tubing is a good material for use as intraoral anchor. Upper anterior surface of denuded area is partially covered by undermining the inner lip mucosa and sliding it downward to be fixed by additional sutures in as low a position as possible. #5: Shaded circle represents region of mucosa-periosteum cicatrization that limits sulcus mobility

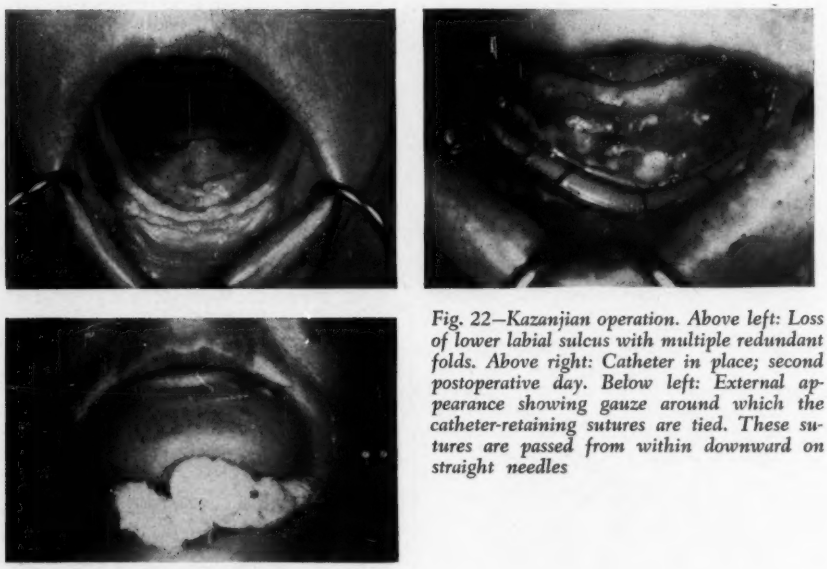

Fig. 22—Kazanjian operation. Above left: Loss of lower labial sulcus with multiple redundant folds. Above right: Catheter in place; second postoperative day. Below left: External appearance showing gauze around which the catheter-retaining sutures are tied. These sutures are passed from within downward on straight needles

same result. Deformities may be of anatomical or congenital origin. The varied physical characteristics of bone play an important part in the behavior of a base in response to occlusal denture pressures. Patients who possess large, dense bones have less trouble with alveolar ridge atrophy than do patients with smaller bony structure.

Regardless of the cause of soft tissue intraoral abnormalities, it is certain that they present obstacles to the prosthodontist which should be overcome if at all possible. Mucous membrane irritations arising from ill-fitting dentures cannot be ignored as contributing factors in the formation of many oral malignancies.

Surgery is not the cure-all for every denture problem, but many mouths can be improved greatly by some type of intraoral plastic surgery. Perhaps only a slight adjustment employing but one technic will suffice in a given case, but many times multiple procedures with revision are necessary to accomplish the desired results. Plastic surgery, whether in the mouth or elsewhere, requires accurate planning, precision and meticulous attention to details.

■ *Tissue Supports*

After an operation, intraoral soft tissues almost invariably require mechanical supports, in addition to sutures, to immobilize flaps and grafts, and for the period of readjustment of tissue during the healing process. It is essential that close adaptation of mucous membrane to freshened submucous tissue be maintained for several days if hematoma formation and shifting of the flaps are to be prevented. Failure to appreciate this may

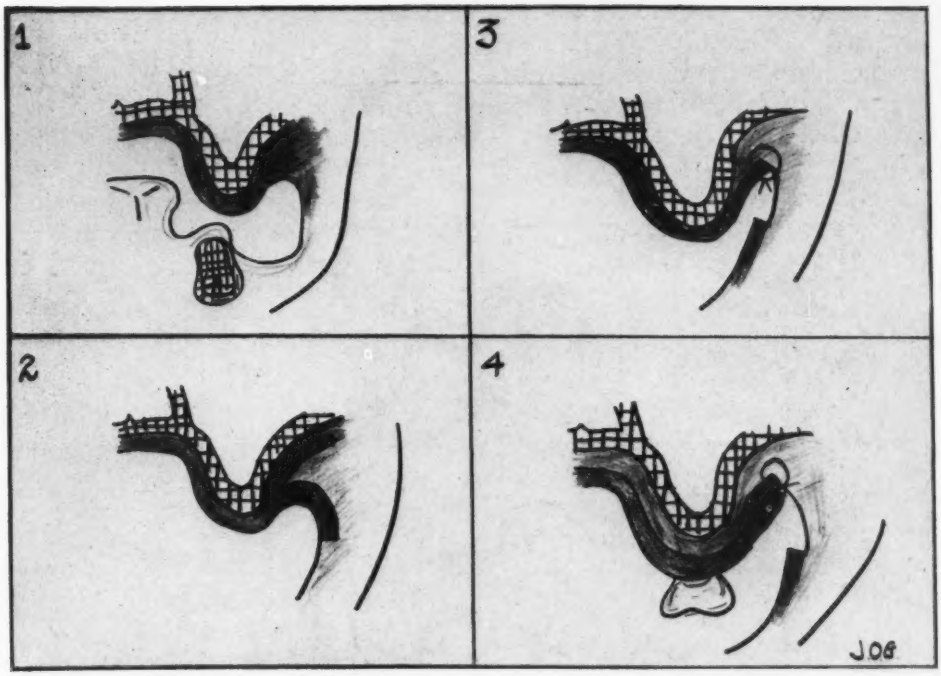

Fig. 23—#1: Loss of buccal maxillary sulcus. #2: Full thickness mucosal flap elevation and supraperiosteal cavity preparation as illustrated in lower jaw, Kazanjian operation. #3: Flap sutured to supraperiosteal and periosteal fibers. Lateral region is left denuded except in some instances where a covering "slide" can be made. Parotid duct opening should be avoided. #4: Flap held in place by immediately inserted denture, with or without surgical cement added to flange

cause the loss of a hard-won buccal or labial sulcus. A few retaining devices which have proved helpful will be described.

Equal parts of zinc oxide and finely triturated resin can be spatulated on a hot slab with eugenol liquid to form a surgical cement that has many uses. Long shreds of absorbent cotton can be incorporated into the soft, thick mass to give it body and stability. This type of splint can be used to form a support for surgerized tissue that must be held tightly against a base to which it has been sutured (Fig. 11). However, the cement can be used in any case if a device is available to which it can be attached

Fig. 24—Two redundant folds in lower buccal sulcus

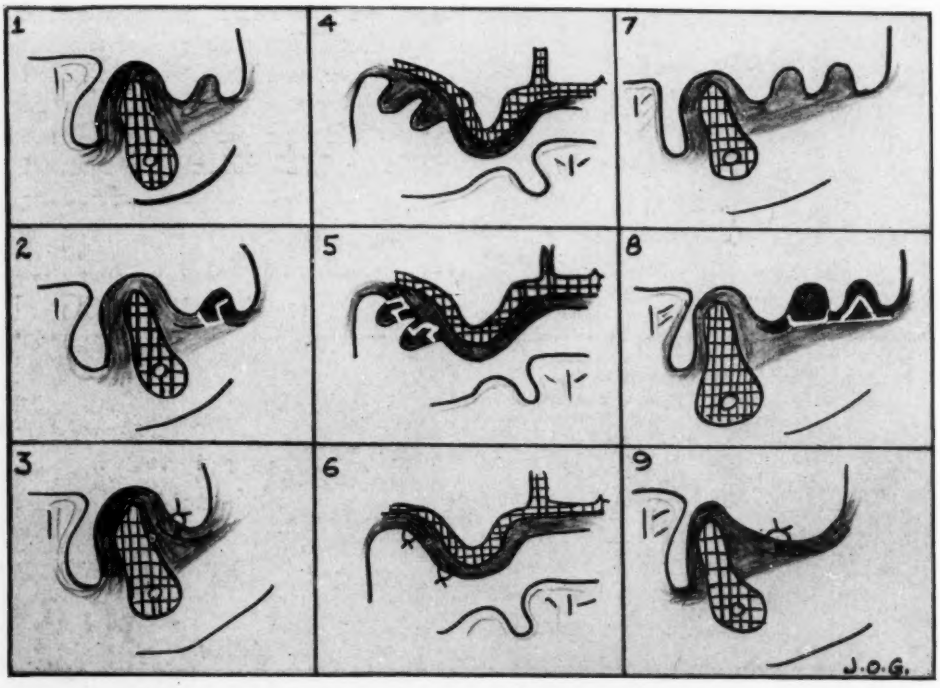

Fig. 25—#1: Single fold in buccal sulcus. #2: Edges undermined and section to be discarded outlined. #3: Wound sutured. #4: Two folds in a sulcus.. #5: One method of treatment. Tissue to be excised is outlined. Removal of both of these folds in one piece without saving any of the interfold membrane would result in serious loss of sulcus depth. #6: Sutures applied. #7: Lower buccal fold diagram of patient shown in Figure 24. #8: Medial fold is excised and mucosa is dissected from second fold. Fibrous tissue which underlies lateral fold is carefully dissected away and discarded. #9: Flap has been slid across denuded area and is sutured in place. Patient's old denture with attached surgical cement periphery is now inserted as previously described

Fig. 26—Multiple folds in upper labial sulcus

(Fig. 12). After the material is placed in the desired location on an old denture, for instance, it is inserted into the mouth and allowed to remain there until the cement is set. The whole splint is then removed, smoothed and reinserted, to be left in place for at least four days. Frequently this revised appliance can be used as a denture until healing is sufficient to allow construction of a new one.

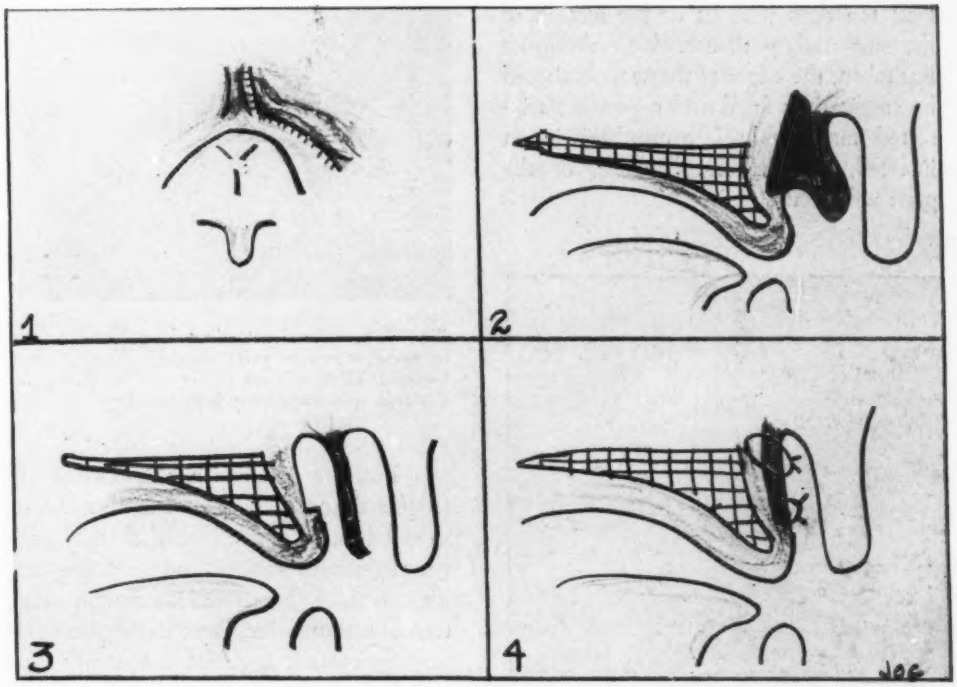

Fig. 27—Cross section description of technic for elimination of labial fold shown on right side of Figure 26. #1: Incision, sharply through mucosa at lower rim of fold. #2: Dissection under mucosa and over fibrous submucous tissue. Heavily shaded portion is dissected away and discarded. #3: Free flap and denuded base appear. Heavily shaded edge of flap represents excess that is to be trimmed away. #4: Flap sutured high in sulcus and at main suture line. Deep sutures are fine chromic gut and mucosal sutures are fine Dermalon

Modeling compound also can be utilized as a good support on occasions in much the same manner as surgical cement (Fig. 13, #2). Intermaxillary wire or rubber band ligation of the teeth will keep the teeth in occlusion and aid the retention of the support. The compound also can be used as a stent around which split-thickness grafts can be wrapped (Fig. 14-15).

When it is impossible to deepen or construct a labial or buccal sulcus from neighboring mucosa, a split-thickness skin graft may be required. This must be supported and be kept in contact with the prepared base by one means or another, depending on the location and the situation encountered (Fig. 14, 15). An incision is made through the region to be freed, care being taken to stay outside of the periosteum. A modeling compound impression is then made of the newly created defect. The graft is then wrapped around the impression with the raw surface on the outside and is inserted into the cavity and kept in position for at

least ten days without undue motion of the surrounding tissues. After the graft has taken, the edges of the wound should be surgically refined and a prosthesis inserted immediately. If a prosthesis is not inserted, considerable shrinkage of the graft will occur.

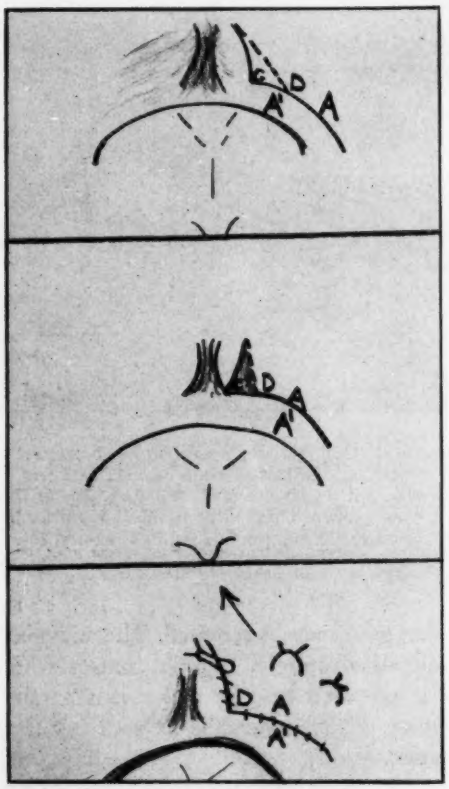

Fig. 28—Anterior view of same procedure as shown in Figure 27. Above: Flap has been outlined and incised from above to C and thence to A. Center: Freed mucosa, after elimination of the fibrous submucosa, has been advanced anteriorly until D is over former position of C, and A is above A'. Shaded triangle of C is then sharply cut away and discarded. Below: Deep and superficial sutures are shown and the wound is now ready for insertion of denture support

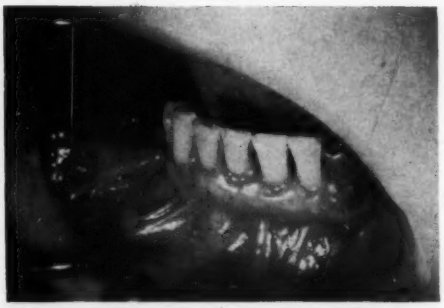

Fig. 29—Scar band extending from buccal sulcus in molar region to point on ridge distal to first bicuspid. Obviously no saddle can be placed in this area until irregularity is corrected

Pressure dressings applied externally frequently are valuable since they assist in stabilization of the tissues, thereby preventing undue motion and reducing the incidence of hematoma formation. External pressure bandages after intraoral surgery are not required frequently but should be utilized when indicated (Fig. 16). Gauze or mechanic's waste under the plastic type adhesive bandage seems to furnish the best and most positive form of pressure, although elastic bandages may be adequate.

■ *Fibrous Tuberosities*

Fibrous overdevelopment or hypertrophy of the posterior, superior molar and tuberosity regions is quite common. Deformities in that region are frequently thick and mobile or they may present undercuts which interfere with denture adaptation. Such deformities require either removal or contouring (Fig. 17, 18).

The descent of upper molars and supporting structure may obliterate the intermaxillary space to such an extent that

partial or complete prosthetic reconstruction is impossible without producing an open bite. Surgery may materially aid the prosthodontist in such situations (Fig. 17, 18).

■ *Flabby Ridges*

Alveolar ridges undergoing atrophy may be replaced by flabby fibrous tissue overlying the crests (Fig. 19). This may be over upper or lower ridges and may be confined to these zones alone. Under this loose, soft tissue there may be sharp bony spines which require attention as previously discussed. The need for elimination of these soft masses becomes apparent when the construction of new dentures is considered (Fig. 20).

■ *Deepening of Mandibular Sulcus*

The loss of lower labial and buccal sulci can be remedied in some instances

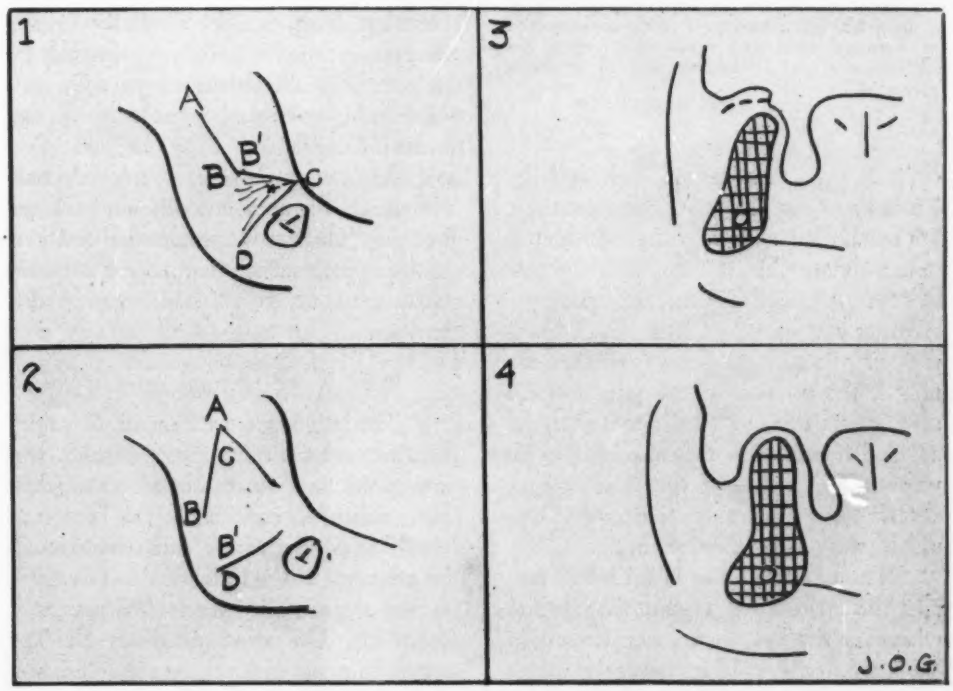

Fig. 30—Technic used to dispose of scar band shown in Figure 29. #1: Sharp incision is made through mucosa from A to B and extended from B' to C to D, BCD being the boundaries of the traction band. The angle ABC, ideally, would be less obtuse and more like the angle BCD but here it was not possible. #2: Mucosa, full thickness, has been undermined throughout. Fibrous tissue under #1 BCD triangle has been cut away. Original BCD angular flap has been transposed and inserted into line AB. The angle AB'C (in #1) has been moved downward into space vacated by BCD and B' now is in contact with D. Fine Dermalon sutures are used to hold flaps in their new locations. #3: Cross section showing by dotted line where flap was freed from area distal to bicuspid. #4: Cross section of region after wound has healed

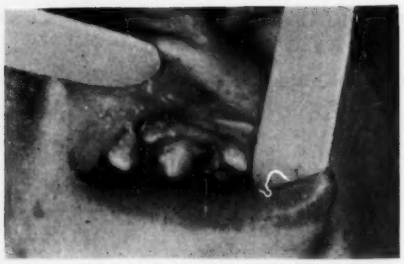

Fig. 31—This patient had been burned by plug on an electric cord when he was two years of age. The lip is fixed to the labial gingiva and the vermilion portion is irregular and scarred. Two teeth in midline are cuspids. In order to restore the teeth by a prosthesis, several surgical preparatory procedures, at intervals, are necessary. These are elimination of malposed teeth and roots; skin grafting for restoration of sulcus, and revision of vermilion portion of lip

by utilizing the method described by Kazanjian (Fig. 21, 22); however, there are certain limitations. If the mandible is extremely atrophic, it is impossible to produce enough depth to warrant the surgery. Another complicating factor which limits the extension of the sulcus incision distally is the position of the mental nerve as it enters the lip. This nerve must be avoided if annoying paresthesia is to be prevented. In spite of these limitations, the Kazanjian operation is useful if employed where conditions permit.

The loss of a lower labial sulcus permits the lower lip to elevate the denture whenever the lip moves. The Kazanjian operation may not always lower the sulcus to a point where much distance is gained, but it does produce a cicatricial fixation between the lower edge of the ridge flap and the periosteum at the depth of the sulcus. This fact makes a relative success out of what may appear to be a partial surgical failure because, when the lip moves after operation, it is prevented from elevating the sulcus mucosa by the mucosal attachment to the scarred base on the lip side (Fig. 21, #5).

■ *Loss of Maxillary Labial Sulci*

Deep labial or buccal sulci, although desirable for maxillary dentures, are not as essential as in the mandibular region. According to the prosthodontists, close palatal adaptation with a tight seal at the flange borders seems to be the secret of proper adhesion and stability of upper complete dentures. Therefore, the sulcus deepening type of operation frequently is not necessary in the upper jaw. On occasions, however, such a procedure seems to be indicated (Fig. 23). The principles are the same, wherever employed, but allowances for anatomic differences must be made. The almost complete obliteration of the upper sulcus calls for some surgical measure to deepen it if such measure can be found.

■ *Folds and Redundancies in Sulci*

The prolonged wearing of ill-fitting dentures creates complications which are dangerous to the wearer. In addition, folds and redundancies about the gingiva, cheeks and sulci may result which must be overcome if the individual is to enjoy, to any degree, the wearing of a dental prosthesis. On some occasions the irregularities, atrophies or hypertrophies are so complex that surgical correction is almost hopeless. Nevertheless, most patients who, through neglect or lack of advice, develop intraoral deformities of this type usually can have the deformity corrected. The removal of folds and redundancies should be undertaken while keeping in

mind the various principles mentioned previously (Fig. 24, 25).

Sharp dissection and tissue support should be utilized. Electrosurgery may be employed at times, but its application is rare since it may be productive of excessive scar tissue formation. Clean, precise surgery with fine suture approximation produces a minimum of cicatrization. The creation of a good buccal sulcus is the goal, and anything which will be an aid should be utilized. The patient's old denture which was irritating should not be worn for about three weeks prior to corrective surgery. It can be inserted, with surgical cement attached, to act as a tissue support after the operation is completed. On occasion it is necessary to perform more than one operation to attain the final desired result.

A technic which has been found useful in the elimination of single or multiple folds is accomplished by sharply dissecting the full thickness of the mucosa away from the fibrous bulges beneath it. These strands of fibrous tissue are then cut away until a smooth base is provided. The large mucosal flap is then shifted anteriorly, the excess trimmed off, the midportion sutured as deeply into the sulcus as possible, the edges sutured with fine Dermalon and, finally, the cement-lined denture placed in the mouth as a tissue support. The cement should be very thick, reinforced by cotton shreds on the flanges, and be put in place just before the "setting" takes place in order to compress the mucosa firmly into the cavity. Four days or more should elapse before the retainer is removed for any length of time. Smooth, deep sulci were obtained more consistently when this technic was used than were obtained with any other (Fig. 26-28).

■ *Scar Bands and Frenums*

The most common groove interferences are scar bands and frenums which have a tendency to mobilize dentures when the cheeks or lips move. Utilization of "Z-plasty," sliding flaps of the Burow, or "V-Y" types and grafts, when required, can lessen these deficiencies. Scar bands respond to "Z-plasty," and frenums or narrow muscle bands seem best treated by transverse, diamond incisions or the "V-Y" technic (Fig. 29, 30).

■ *Multiple Procedures*

Patients may require many and varied surgical procedures if dentures ever are to be worn. The need for careful plan-

Fig. 32—Another example of instance where multiple procedures are required at planned intervals. During childhood this woman had been given an overdose of calomel and she suffered massive intraoral ulceration induced by mercurial stomatitis. Upper and lower alveolar ridges were bound together in molar and bicuspid areas by broad cheek scars. Only upper extremity of traction band on the right side is shown here. Dentures were constructed after several intraoral plastic procedures carried over a period of a year. At various intervals skin grafts, "Z-plasty" and revisions were employed to produce buccal sulci and to permit the patient to have sufficient intraoral space for acceptance of a prosthesis

ning and the employment at proper intervals of various technical methods are imperative. Seldom if ever is it advisable in complicated cases to attempt too much at any one time (Fig. 31, 32).

■ *Summary*

Many of the deterrents to satisfactory intraoral prosthetic reconstruction are outlined and a few surgical aids are suggested which can combat or eradicate them. The expenditure of much fruitless energy by the prosthodontist can be avoided if anatomical variations and tissue interferences are attacked surgically prior to appliance construction. Circumvention frequently leads to failure. It is true that surgery is no panacea. Many mouths never can approach the ideal and surgical failures occur. However, if all the tools available are utilized, both dentist and patient will be much more satisfied with the end result.—*501 Second National Bank Building.*

Antibiotics and intraoral bone grafts

■ *Bernard M. Cohen, D.D.S., Far Rockaway, L. I., N. Y.*

The use of bone grafts to eliminate defects in the jaws is a well-established practice. The usual approach has been through an external rather than intraoral approach because of the possibility of bacterial contamination. The danger of contamination of a graft as a result of perforation into the mouth is a complication that usually has been followed by infection and exfoliation of the implant. With the development of adequate antibiotic therapy, however, the intraoral approach has become possible.

The elimination of postoperative bone defects in the jaws by placement of autoplastic or homoplastic bone grafts speeds the healing process and preserves the bony architecture. The cases described herein exemplify the elimination of space defects in bone, and it is conceivable that, with some variation, the procedure might be applied in instances where the continuity of the mandible is lost.

■ *Rationale of Treatment*

The success or failure of a graft depends on the amount of its surface that is brought in contact with living tissue. This is just as true of the autoplastic graft

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as it is of the homoplastic graft; both types are gradually resorbed and eventually replaced by vital bone which in time becomes functionally adequate.[1]

Usually the transplant will be successful if a severe inflammatory reaction does not develop. The presence of the graft changes the healing process so that it resembles the typical callus formation at the site of bone contact in fractures. Once the continuity is re-established, functional rebuilding of the graft proceeds over a long period of time.

Cancellous bone chips provide a greater surface for the penetration of young connective tissue than does a large single graft. This, it was thought, would speed up healing and elimination of the bony defect. In Cases 3 and 4, the buccal plate was removed so that greater periosteal contact would be provided. This was not necessary in Cases 1 and 2 because of the destruction of the greater part of the mandible with the same resultant conditions. Case 2 was treated with a large single autoplastic implant plus chips, but it required four months longer to reach the same stage as was reached in Case 1 which had been packed with chips only.

Homoplastic chips from the bank were used for Cases 3 and 4, and it took approximately five months to reach the healing stage shown in Figures 14 and 17. It is not entirely fair to compare Cases 3 and 4 with Cases 1 and 2 since rib sections from the bank provided the material in the last two cases, whereas the first two were treated with bone from the iliac crest. It is my impression that cancellous bone from the bank would have provided a fairer comparison. In Cases 1, 3, and 4 the grafts were placed intraorally, whereas in Case 2 it was placed extraorally; however, in this instance an oral fistula developed.

■ *Antibiotic Therapy*

All the patients in this series were placed on systemic antibiotic coverage several days prior to surgery, and this was continued for a number of days after oral suppuration appeared. Penicillin in heavy doses usually was given initially. When infection developed, smears and cultures were taken and sensitivity tests performed every few days. The predominant organism was thus determined, and the drug to which it was sensitive was selected. The systemic administration of the drug thus selected was continued, but it was supplemented with oral irrigations of the same material into the wound. Mouthwashes were provided containing the antibiotic in use at each change of the drug. Systemic therapy was discontinued after 12 to 16 days and local measures were utilized. Suppuration usually ceased in from 30 to 40 days, but treatment was continued for a number of days longer. This may have been excessive caution, but was felt to be justifiable.

Infection occurred in all of the cases shortly after the surgical intervention, and the anterior portion of the wounds opened. Through this fistula, a number of small chips either were exfoliated or were removed as they became separated from the investing soft tissues. Most of the material thus removed was partially decalcified and caused irritation. Once granulation appeared within the wound, suppuration ceased with the exception of that

1. Weinmann, J. P., and Sicher, H. Bone and bones. St. Louis, C. V. Mosby Co., 1947, p. 310-312.

Fig. 1—Case 1. Preoperative roentgenogram, June 28, 1952

caused by small detached bone fragments which were subsequently removed. When this stage was reached, acrylic splints were constructed and placed over the area, and the jaw was allowed to function with good results.

■ *Case 1*

A 22 year old white, obese woman was referred because of pain in the lower right side of the face which had continued for about two weeks. On June 28, 1952, roentgenographic examination revealed the presence of a large radiolucent area in the right body and ramus of the mandible (Fig. 1). The physical examination made when the patient was admitted to the hospital disclosed that the blood and urine were within normal limits.

Intraoral examination revealed the presence of a mass in the body of the mandible on the left side. There was no indication of inflammation, but distinct crepitus was elicited on palpation.

The roentgenograms and the history were suggestive of ameloblastoma. Preparations were made for possible resection.

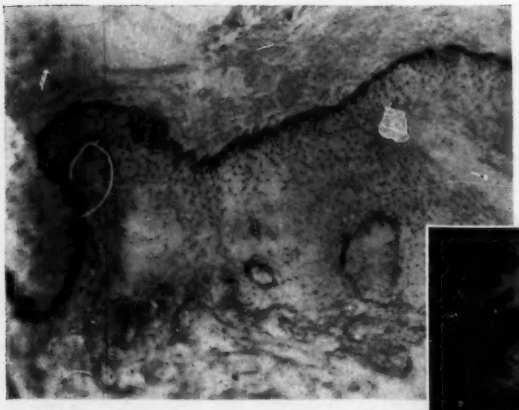

Fig. 2—Case 1. Left: Photomicrograph of tissue showing typical ameloblast type cells

Right: Lower-power view of tissue shown above

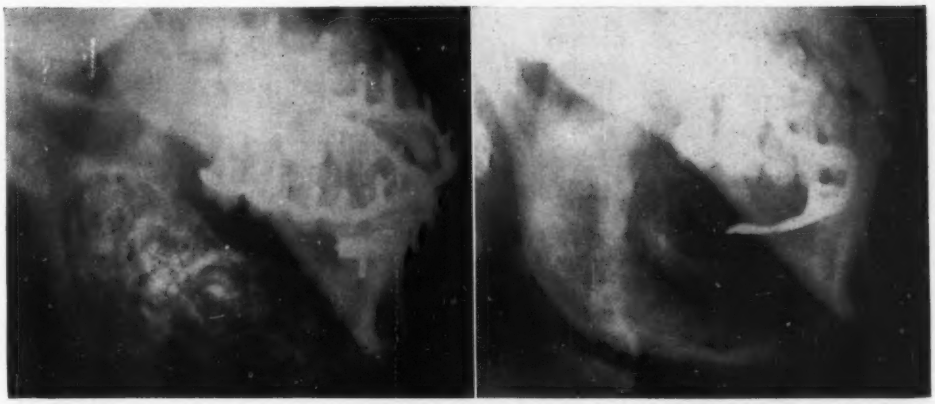

Fig. 3—Case 1. Left: Postoperative roentgenogram showing bone chips in place, July 14, 1952. Right: Postoperative view taken January 29, 1953

Two appliances were constructed, one to replace the resected portion of the mandible and the other to aid in the control of a possible fracture in the event of a more conservative approach. A frozen section taken at the time of operation was to be the deciding factor.

On July 14 the patient was prepared for the operating room with the usual premedication. Anesthesia was established with thiopental sodium-curare and an endotracheal tube was inserted. The usual preparation of the surgical site was carried out and the patient was draped. An intraoral incision was made from the coronoid process to the cuspid region, where it was angulated anteriorly into the mucobuccal fold. The flap thus outlined, including the periosteum, was elevated. A bulging, friable, reddish mass was exposed. A portion was removed and the frozen section revealed it to be ameloblastoma (Fig. 2).

In the anterior region, the mass could be separated easily from the mandible and was thought to appear cystic. Some clear, thin, yellow fluid was aspirated from this area and cultured. The dissection was continued upward into the region of the coronoid process and sigmoid notch where the character of the mass was somewhat different. It was difficult to remove the mass *in toto;* therefore, small pieces of red, friable tissue were excised. The entire buccal and lingual plates had been destroyed in the body of the mandible, but a portion of the inferior border remained. The entire region was cauterized and packed with bone chips that had been taken from the crest of the ilium (Fig. 3, left). Whole blood (500 cc.) was given during the operation, and the patient returned to bed in good condition.

The postoperative period was not unusual. The patient was kept on antibiotics, and the oral sutures were removed on the seventh day. On the tenth postoperative day, the anterior third of the oral incision opened and suppuration appeared.

Culture of the exudate showed the

Fig. 4—Case 2. Preoperative roentgenograms taken September 21, 1951

presence of nonhemolytic *Staphylococcus albus*. This organism proved sensitive to penicillin, which was then administered for 12 days. A new culture showed the presence of coliform bacilli. Penicillin was discontinued and streptomycin and oxytetracycline therapy was instituted to control the coliform infection. After 16 days of this treatment, hemolytic *Staphylococcus aureus* and gram-positive cocci appeared in the cultures; these organisms were resistant to oxytetracycline. This drug was dropped from the treatment schedule but streptomycin therapy was continued, supplemented by chlortetracycline because of the appearance of *Aerobacter aerogenes* and gram-negative rods, for 14 days. Chlortetracycline was given alone for an additional three days.

Forty-five days postoperatively, the area had granulated sufficiently for the patient to be able to wear an acrylic splint. Seven months later, bone healing had progressed as shown in Figure 3, right.

■ *Case 2*

On September 21, 1951, a 22 year old negro man was referred with a complaint of a swelling in the left side of the mandible of about one year's duration. In September 1948 the lower left second and third molars had been removed, and in December 1949 the upper left third molar

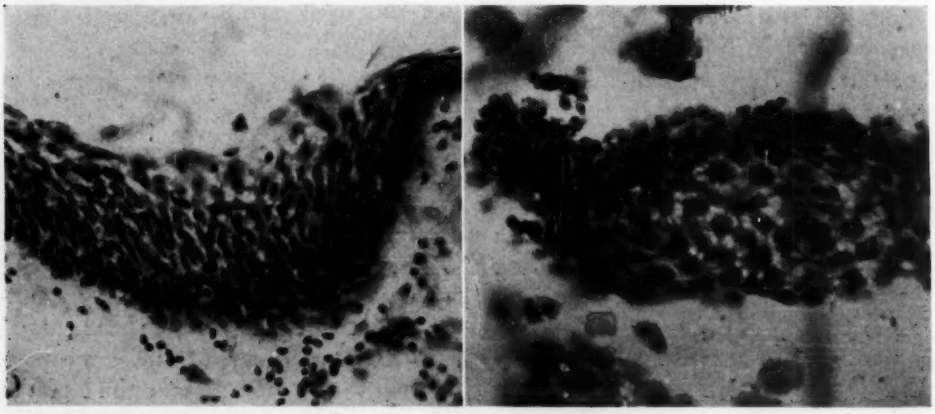

Fig. 5—Case 2. Left: Low-power microscopic section showing squamous epithelium which was everted during preparation of specimen. Right: Higher power view of lining wall of cyst showing typical stratified squamous epithelium

had been extracted and a "growth" had been removed from the lower third molar region. No other information could be elicited regarding the reason for the procedure.

Roentgenographic examination revealed a large radiolucent defect in the body of the left side of the mandible which was suggestive of multilocular cyst or ameloblastoma (Fig. 4). The patient was admitted to the hospital where a physical examination showed that the blood and urine were essentially negative. An intraoral biopsy was done on September 23, and a follicular cyst was reported (Fig. 5).

The patient was prepared for operation on October 2, 1951. Since we had had no previous experience with intraoral bone grafts, an external incision was planned. A splint was constructed in the event of a fracture and was placed prior to the surgery. While the orthopedic surgeons removed a section of the iliac crest, the operation proceeded in the facial region.

An incision was made about 5 mm. below the lower border of the mandible that extended from the angle anteriorly to about the cuspid region. The dissection was carried through the investing tissues to the mandible. A bulging white mass was exposed and brought into direct visualization. It was easily separated from the body of the mandible and followed posteriorly up into the sigmoid notch and neck of the condyle. This portion of the cyst wall was thin and adherent to the bone, in direct contrast to the condition found in Case 1. Half of the medial surface of the ramus had been eroded and the greater portion of the width lost. The internal pterygoid muscle could be seen bulging into the defect after the mass had been removed. The inferior alveolar canal had been completely obliterated, leaving the nerve and vessels free in the base of the defect. A large autoplastic graft which had been prepared was placed, and the remaining region was packed with bone chips (Fig. 6, left). The incision was closed in layers and the patient returned

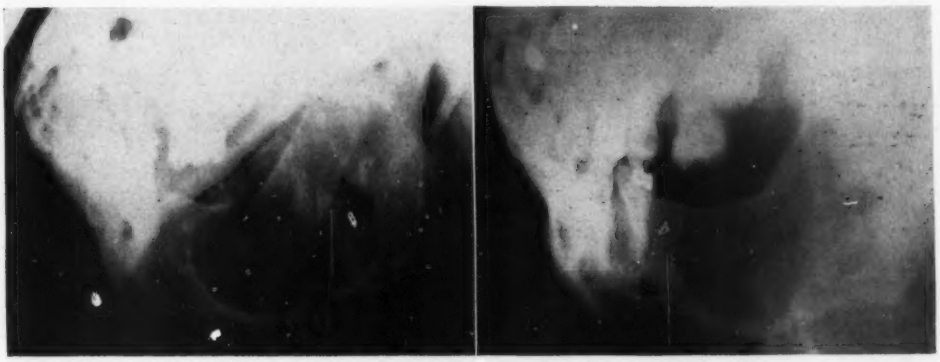

Fig. 6—Case 2. Left: Postoperative roentgenogram showing graft in place, October 2, 1951. Right: Postoperative view, October 13, 1952

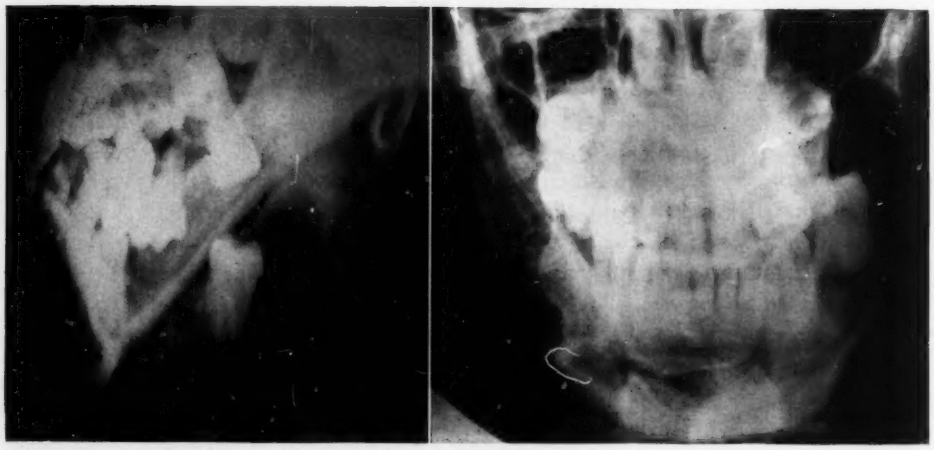

Fig. 7—Case 3. Left and right: Preoperative views taken July 28, 1952

to bed. He seemed to be in good condition.

The usual antibiotic therapy was given, but ten days later the intraoral site of the biopsy broke down and a fistula developed.

Culture from the wound showed the presence of gram-positive cocci, pneumococci and beta hemolytic streptococci, all of which were controlled with penicillin therapy. After 14 days, the bacterial flora had changed to gram-negative bacilli of the coli-aerogenes group. Streptomycin was substituted for penicillin, but after 12 days of this regimen *Neisseria catarrhalis*

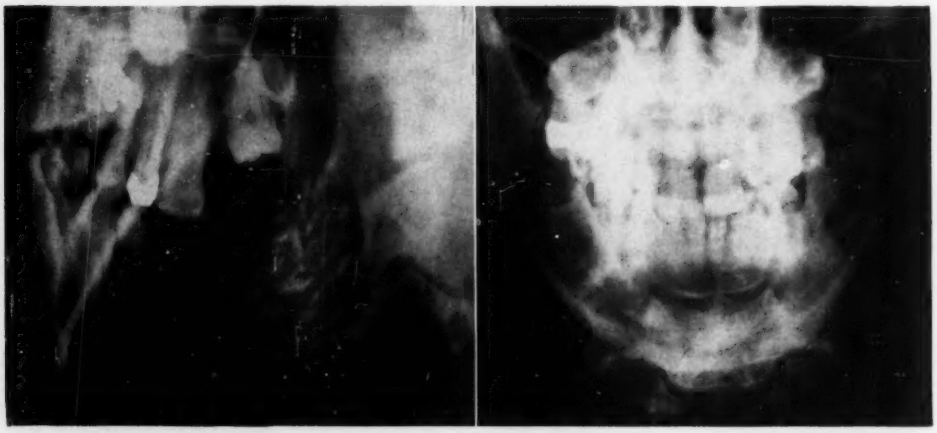

Fig. 8—Case 3. Left: Postoperative view showing cavity packed with bone chips, August 7, 1952. Right: Posteroanterior view, August 7, 1952

and alpha hemolytic streptococci appeared in the culture. These proved sensitive to chloramphenicol. After ten days treatment with these drugs, suppuration ceased. Treatment was discontinued three days later and the opening closed thereafter.

The final biopsy report was follicular cyst with early ameloblastic changes.

One year later, the graft had completely consolidated (Fig. 6, right) and excellent functional contour of the ramus and body resulted.

■ *Case* 3

On July 25, 1952, a well nourished white man, aged 24, with an acute swelling of the right side of the face was admitted to the hospital. The lower right third molar had been removed on June 15. Two weeks later, the right side of the face had begun to swell, and the patient had received penicillin therapy from his physician. The condition had become progressively worse until the patient had come to the hospital for treatment.

Roentgenographic examination revealed the presence of a large radiolucent defect in the body of the right side of the mandible (Fig. 7). Examination showed the blood and urine to be within normal limits. The patient responded well to the treatment of the acute phase, and on August 6 the operation was performed.

The routine preoperative medication was given, and the regional anesthesia was established with 2 per cent procaine. An incision was made along the crest of the ridge from the retromolar triangle to the bicuspid region where it was angulated anteriorly to the mucobuccal fold. The flap thus outlined was elevated from the mandible, and a bluish mass which had eroded the buccal plate was brought into view. The buccal bone over the cyst was removed and the entire region exposed. The lining membrane was separated from the bony wall, the impacted molar loosened with an elevator, and the entire

Fig. 9—Case 3. Left: Defect open intraorally, September 6, 1952. Right: View taken January 26, 1953 showing almost complete regeneration

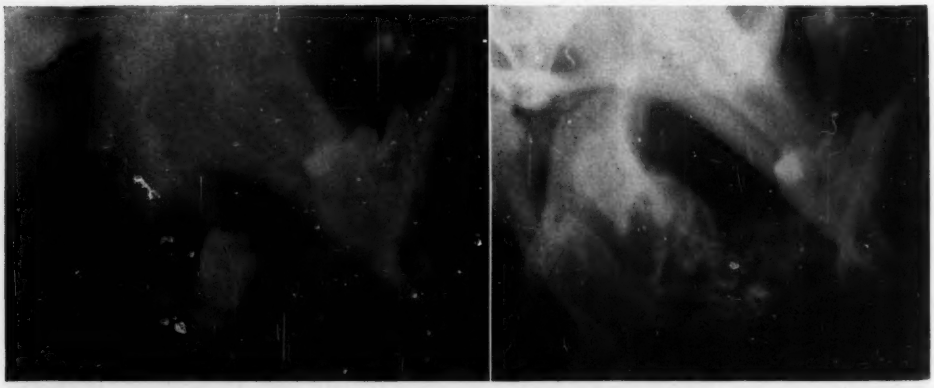

Fig. 10—Case 4. Left: Preoperative roentgenograms, July 15, 1952. Right: Postoperative view showing region packed with bone chips, July 17, 1952

specimen removed. The edges of the cavity were smoothed, and the region filled with small bone chips which had been obtained from a section of rib in the bank (Fig. 8). The region was closed with no. 000 silk sutures, and the patient returned to bed in good condition. The usual antibiotic therapy was instituted. On the fifth postoperative day, suppuration developed in the site and smears were taken for culture and sensitivity tests.

Fig. 11—Case 4. Postoperative view taken January 10, 1953

Penicillin was administered to control the nonhemolytic streptococci which were present. Ten days later *Aerobacter aerogenes* and gram-negative rods were cultured from the wound. These organisms were resistant to penicillin but showed a response to chlortetracycline. After 25 days of chlortetracycline therapy, *Staphylococcus albus* and gram-positive cocci appeared. These were controlled by administration of chloramphenicol. About 12 days later, the bacterial flora changed to *Aerobacter aerogenes* and gram-negative rods which proved resistant to all antibiotics *in vitro*. The region closed, however, and healed by itself 47 days after the onset of suppuration.

Subsequent microscopic examination of the tissue removed revealed it to be a follicular cyst. Figure 9, left, shows the open defect four months postoperatively. Six months postoperatively (Fig. 9, right) the lesion had almost healed.

■ *Case 4*

The patient had no subjective complaints; however, a large radiolucent defect was discovered in the left body of the mandible during a routine roentgenographic examination prior to the construction of a partial denture (Fig. 10, left). The patient was admitted to the hospital, and physical examination showed the blood and urine to be within normal limits. The patient was prepared for operation with the usual premedication. Anesthesia was established with 2 per cent procaine. An incision was made along the crest of the ridge from the retromolar triangle anteriorly to the bicuspid region where it was angulated into the mucobuccal fold. A small opening was made in the buccal plate, and a rongeur forceps used to remove the greater part of the bone. The cyst and impacted molar were removed and the region was débrided. A chip bone graft from a section of rib preserved in the bone bank was used to fill the defect (Fig. 10, right). The site was closed with no. 000 silk sutures. Six days later, the region broke down despite penicillin therapy. Culture of the material and sensitivity tests showed the presence of coliform bacilli that were sensitive to streptomycin which was given for 18 days. *Staphylococcus albus* then appeared in the cultures, but these organisms were controlled by chlortetracycline which was administered for the next 17 days.

Thirty-five days after the appearance of suppuration, the region had closed and healed. Figure 11 shows the progress of healing in the region six months later.

■ *Conclusion*

Intraoral bone grafts can be utilized satisfactorily if proper antibiotic therapy is administered. Although the number of cases discussed in this paper does not furnish conclusive evidence, a larger series will be reported on at a later date. It is felt that the method of treatment has merit and warrants further investigation.—*1931 Mott Avenue.*

■ VISAS AND MEETINGS

Within recent months the U. S., partly or wholly because of its visa policy, has lost five international scientific meetings, according to a report by the President's Commission on Immigration and Naturalization. They were the International Congress of Psychology, the International Congress of Genetics, the International Astronomical Union, the International Federation of Documentation and the International Physiological Congress.

The President's Commission noted that temporary visitors, even if they are to be in the country only for a few hours, "must satisfy substantially all the health, financial, security and other requirements that apply to permanent immigrants." It agreed with the *Manchester Guardian* that: "This visa business is doing the U. S. incalculable harm and is undoing all the lavish propaganda about its noble leadership of the free world."—*Science and the Citizen. Scientific American 188:46 March 1953.*

Iliac autoplasty for repair of mandibular defects

■ *J. R. Hayward,* D.D.S., M.S., Ann Arbor, Mich., and John P. Roffinella,† D.D.S., M.S., San Francisco*

Unique features of structure and function constitute special problems in reconstructive surgery of the mandible. Acting as a mobile unit, the mandible is the supporting mechanical framework for the tongue, floor of the mouth, muscles of mastication and facial expression. In addition to masticatory function, the mandible is essential to normal contour of the facial skeleton. Defects of the mandible, therefore, require specific modifications in principles of immobilization, preparation of fragments, choice of replacement bone and fixation of fragments. Significant variations in the contour and proportions of cortical and cancellous bone are limitations to the application of metallic pin and plate fixation which are routinely used in other bone surgery. The mobility of the mandibular unit and its multiple muscle attachments increase the problem of immobilization. With effective mastication and normal facial contour as surgical objectives, the criteria for successful replacement of mandibular bone defects are very exacting. The bone graft principles will be reviewed and four cases will be presented to illustrate mandibular defects which have resulted from trauma and infection.

■ *Bone Graft Principles*

Healing of bone grafts is governed by the same biologic and mechanical principles through which fractures are united. The fragments must be replaced in normal alignment and maintained rigidly so that the biologic sequence of repair will restore normal form and function of the bone. Defects of bone which require osseous replacement may result directly from trauma or infection, with preliminary processes of malunion or nonunion. Local prerequisites for graft procedures include an absence of infection, adequate blood supply, preparation of fragment surface margins, and adequate means for absolute fixation. Scar tissue must be removed from the bed, and adequate soft tissue covering must be provided in order to insure the required good blood supply to the region. The higher vascular tissues in the region of the mandible are of great benefit to osseous repair in this region. If eburnated surfaces of ununited fragments are presented, they must be decorticated to provide cancellous bone margins to approximate the graft. The devitalizing action of radiation therapy is a local contraindication to bone grafting. The patient must be free from any generalized bone disease or metabolic defect. The general status of the patient must be maintaind at ideal levels for the graft procedure, and it must be enhanced by fortified nutrition and adequate antibiotic coverage.

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Four types of osseous transplantation have been suggested for repair of defects: (1) autoplastic—transplantation of bone from the same individual; (2) homoplastic—transplantation from the same species, preserved or bone-banked bone; (3) heteroplastic—bone from a different species; (4) alloplastic—use of a bone substitute. While adhering to those principles which seem to be most biologic, we have concurred with many others in finding great merit in autogenous bone from the crest of the ilium. This source provides ready accessibility, configuration for requirements of mandibular defects, and cancellous bone of excellent quality which has been recognized to favor viability of the graft. The advantages of osteogenetic potential of cancellous grafts are attributed to the spaces provided for vascular proliferation from the bed and the increased osteogenetic endosteal surfaces of the trabeculae.

Two theories of bone graft healing have been advanced. The "replacement phenomenon" describes aseptic necrosis, with gradual replacement of the graft, which in itself only supplies the inorganic elements and structural scaffold for new bone formation. The "revascularization theory" describes the retained vitality of the autogenous graft by prompt establishment and maintenance of blood supply. Both processes undoubtedly play a role in the healing of the autogenous iliac grafts described in this report. The red marrow of iliac cancellous bone provides the best possible structure for revascularization. This has been found to occur within three weeks. Although the periosteum of the graft bed is very important to healing, the osteogenic potential of periosteum transplanted with the bone graft is not significant.

It will be noted that the mechanical means for stabilization used in the cases described herein are designed for maximum strength and have been combined with intermaxillary fixation. Complete immobilization is paramount, and the intermaxillary fixation is maintained for a period of time about one third longer than that used for fractures without bone loss. The useful employment of both chip grafts and block section grafts will be illustrated. In smaller defects, a combination of transosseous plate fixation and chip grafts has proved satisfactory. When intraoral fixation appliances can provide absolute rigidity, the larger mandibular defects are repaired more easily by single block sections which can be contoured accurately to the requirements of the defect.

The following four cases present varieties in etiology of bone defect, timing of repair, various fixation appliances, and the two types of autogenous iliac grafts.

■ *Report of Cases*

CASE 1—The following case history illustrates the combined use of iliac grafts for traumatic defects, first, in order to unite the mandible and, second, to supply missing facial contour. A 24 year old infantryman had sustained face and jaw injuries from enemy small arms fire near Mogori, North Korea on September 2, 1951. Preliminary débridement and suturing were done at a mobile surgical unit and the diagnosis established of a perforating facial wound with shattered bilateral compound comminuted fractures of the mandible with loss of bone (Fig. 1, left).

The patient was evacuated by air and

was admitted to an army general hospital two and one-half weeks after his injury. The primary sutures and submental drains were removed, as well as a temporary fracture splint. Impressions of the jaws were taken for construction of metallic cast fracture splints. By means of closed reduction, the fracture cast splints were inserted three days after admission. Intermaxillary fixation was established, and the patient was continued on general supportive care and antibiotics. Over a period of two months roentgenograms indicated adequate healing of most of the mandibular fracture sites but revealed bone loss and nonunion in the molar region on the right side (Fig. 1, right). No evidence of infection or drainage was noted on this side. A bone graft procedure was planned to repair the osseous defect.

A transosseous stainless steel splint was constructed for implantation at the time of grafting. Two and one-half months after admission the patient was taken to the operating room, where at open operation the fragments were properly aligned and fixed in place with stainless steel plate. The surfaces of the fracture fragments were freshened and scar tissue removed before filling the defect with cancellous chips from the left iliac crest (Fig. 2, left).

The surgical approach to the mandible was through a 5 cm. incision below the inferior border of the mandible. The patient's postoperative course was uneventful, and intermaxillary fixation was removed eight weeks after the operation. Although the defect was satisfactorily replaced by the bone graft for adequate union of the mandible, the severe comminution of fragments in the region of the symphysis of the mandible left the patient without a normal chin prominence. Accordingly, three weeks later, a second bone graft was taken from the opposite iliac crest for grafting to the symphysis region of the mandible. An incision was

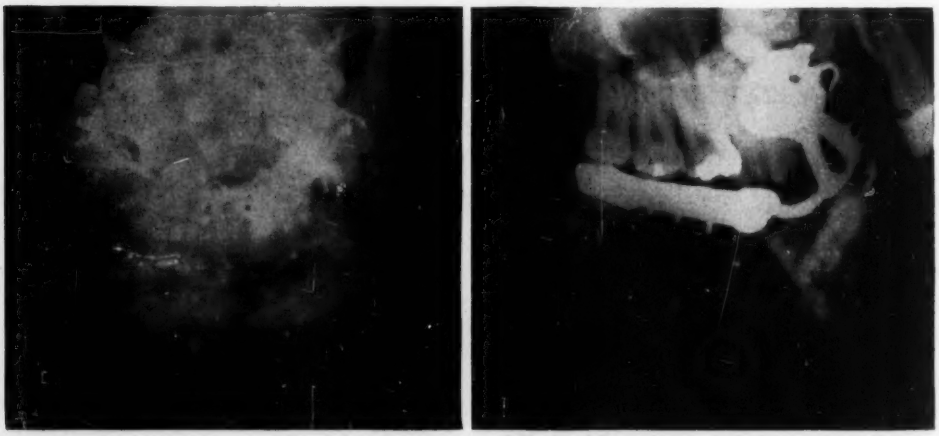

Fig. 1—Case 1. Left: Extensive comminution of multiple mandibular fractures. Right: Residual bone defect and nonunion of right side of mandible

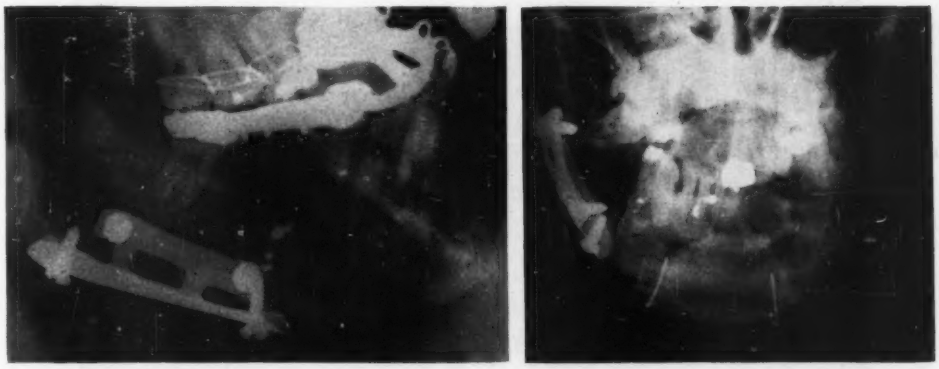

Fig. 2—Case 1. Left: Stainless steel implant for stabilization of fragments and iliac chip graft in place. Right: Splint for chip graft and symphysis block iliac graft wired in place

made in the submental region, and the periosteum reflected from the anterior surface of the mandibular symphysis. The dense cortical bone surface was perforated over the area to be covered by the graft, and the single section block graft was then fixed in position by direct transosseous wiring. The closure was uncomplicated, and the postoperative course brought uneventful healing (Fig. 2, right). In order to complete the patient's oral rehabilitation, upper and lower partial dentures were constructed before his discharge four months after his original admission (Fig. 3).

CASE 2—The following case history illustrates a mandibular bone defect that resulted from an extraction complication and inadequate response to fracture treat-

Fig. 3—Case 1. Facial appearance after mandibular reconstruction

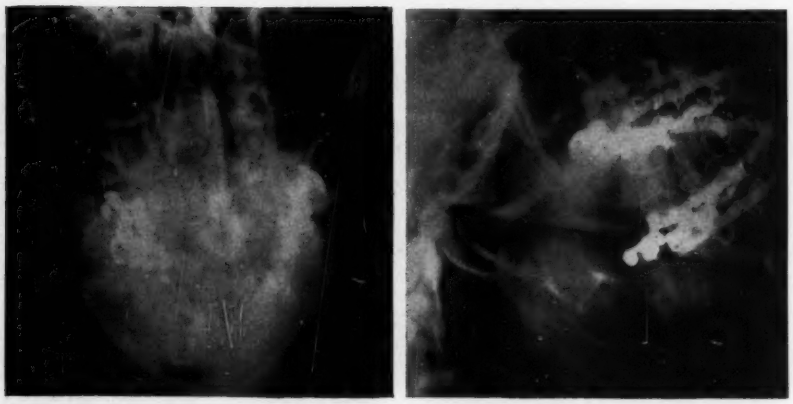

Fig. 4—Case 2. Left: Fracture of right side of mandible that complicated attempted extraction of impacted third molar. Right: Position of fragments after open reduction

ment. A 37 year old housewife had sustained a fracture at the angle on the right side of the mandible while an impacted third molar was being removed. The patient was referred to University Hospital on the same date for treatment of the fracture (Fig. 4, left). Clinical examination and roentgenograms indicated a unilateral compound comminuted fracture of the mandible from the left third molar region through the angle. The remains of the third molar were still present in a proximal fragment, and a defect of cortical bone was present around the tooth. Both the buccal and lingual cortical plates in this region had been removed, and only the inferior border of the mandible remained at the site of fracture. The past history, general physical examination, and laboratory findings were all within normal limits.

Fig. 5—Case 2. Displacement of fragments and nonunion two months after open reduction

Two days after admission the patient was taken to the operating room where maxillary and mandibular arch bars were placed and an open reduction was performed through an inframandibular approach. The proximal fragment was retracted superiorly, and at operation was reduced and fixed in place by means of transosseous wiring. The remaining portion of the third molar was removed at

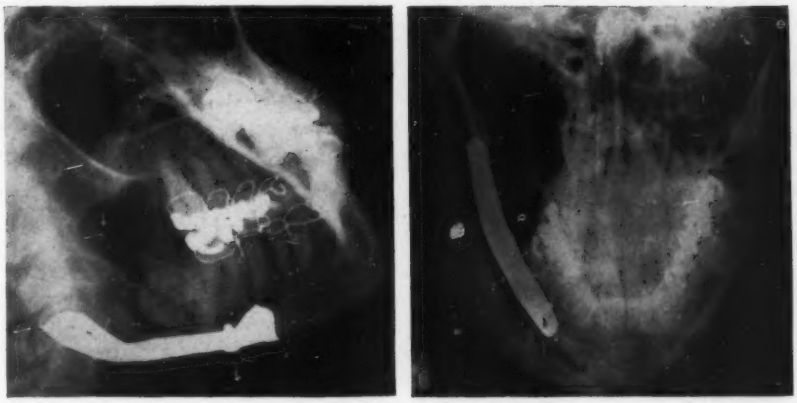

Fig. 6—Case 2. Tantalum splint and iliac chip graft in place

operation. The patient's convalescence was uneventful, and she was discharged on the fourth postoperative day.

The patient was followed on an outpatient basis, and recovery seemed satisfactory. Roentgenograms showed good apposition of the fragments and satisfactory status two weeks after the open reduction (Fig. 4, right). The intermaxillary fixation was discontinued after six weeks, and the patient appeared to be in good condition until her return two months later, at which time there was moderate swelling in the side of the face over the site of open reduction. Roentgenograms revealed overlapping and

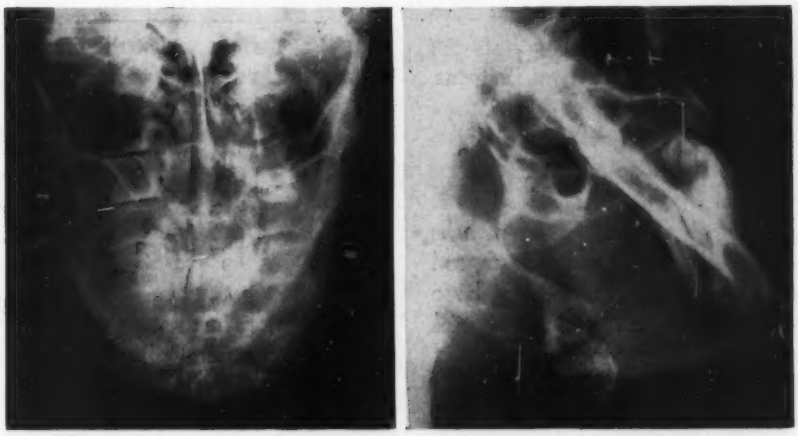

Fig. 7—Case 3. Mandibular defect of four years' duration resulting from previous fracture and osteomyelitis.

stepping of the fragments, with evidence of nonunion and displacement of the transosseus wire (Fig. 5). Moderate intraoral suppuration was evident in the region of the retromolar zone. The patient was readmitted to the hospital, and intermaxillary fixation was again placed after extraction of the mandibular second molar which appeared to be involved in the infected site of nonunion. After a regime of antibiotics and immobilization, the patient became asymptomatic and was discharged for a period of two months. During this time she was followed carefully, and there was no evidence of infection or inflammation. At the end of this period she was again readmitted to the hospital, where an open reduction was again performed, with realignment of the fracture fragments, débridement of necrotic and fibrous tissue, and freshening of the fragment surfaces was carried out. A tantalum transosseous plate was then inserted and fixed to secure the fragments in their proper position by means of screws and wires for rigid stability. The defect was then filled with bone chips taken from the crest of the left ilium.

The patient's recovery was uneventful, and the intermaxillary immobilization was continued for six weeks. Subsequent roentgenographic examination indicated bony regeneration in the area of defect (Fig. 6). During the succeeding months of observation there was evidence of good healing of the soft tissue and the bone operative sites, with restoration of normal mandibular function and appearance. Residual symptoms of mental nerve anesthesia were subsiding at the patient's last visit three months after the bone graft procedure.

CASE 3—The following case history illustrates a large bone defect that resulted from a neglected fracture of the mandible, complicated by osteomyelitis. A 43 year old white laborer had sustained a fracture of the left angle of the mandible approximately four years prior to his admission to University Hospital. The fracture had not been treated and it became infected. Drainage developed through a cutaneous fistula below the angle of the mandible and continued for approximately one and one-half years. The patient complained of being unable to masticate food, with gradual loss of weight and total anesthesia of the left side of his lower lip since the incident of trauma. He complained of pain when attempting to eat any solid food. The remaining past medical history was essentially negative and noncontributory.

Physical examination revealed a slightly undernourished and underdeveloped white man with slight facial asymmetry due to deviation of the mandible to the left side. A definite defect could be palpated in the region of the angle of the left side of the mandible, and a proximal ascending ramus fragment was retracted superiorly. Independent movement of the two fragments was elicited easily. Oral examination indicated gross periodontal disease and chronic neglect. Two small scars in the left inframandibular region were completely healed. There was no evidence of any inflammatory reaction in the region of nonunion. All of the general physical findings and laboratory findings were within normal limits. Roentgenographic examination disclosed an old ununited fracture of the left side of the mandible. The ascending

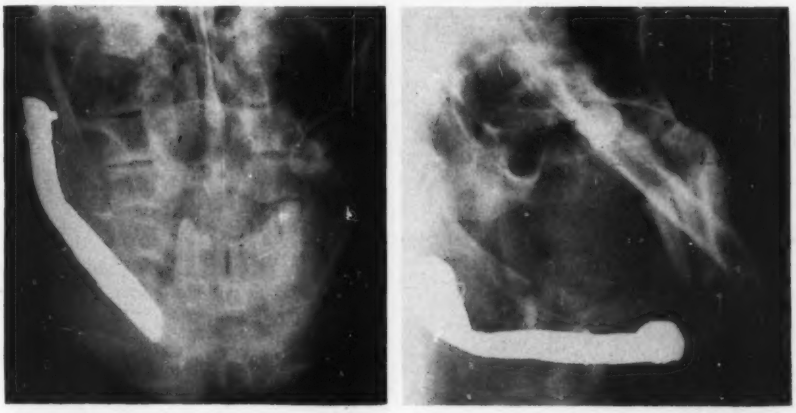

Fig. 8—Case 3. Tantalum plate fixation and iliac chip graft repair of defect

ramus fragment was retracted anteriorly and superiorly, and there was a 3 cm. bone loss deficit from the inferior border of the mandible (Fig. 7).

After several days of supportive care and antibiotics, an open reduction was carried out through an inframandibular incision extending from the angle of the mandible to the region of the left mental foramen. The fracture fragments were identified, and the dense scar tissue in the region was excised. The eburnated cortical bone over the surfaces of the fracture fragments was removed in preparation for the graft procedure. A contoured transosseous tantalum plate was then fixed to the reduced fragments with screws and wires in order to secure them in their proper anatomic relationship. Bone chips were then secured from the left iliac crest and were placed in the defect. The remnants of periosteum were closed over the graft, and the musculature and subcutaneous tissues were closed in layers. The skin incision was closed and dressed in routine fashion. The patient tolerated the procedure well and had a totally uneventful convalescence. He was maintained on a liquid diet and support for the mandible, although, because of the edentulism, no intermaxillary fixation was employed.

The patient has been followed at regular intervals for the past six months and has shown evidence of complete soft tissue healing and good bone regeneration (Fig. 8). He is without complaints, and the mandibular contour and function are adequate for denture prosthesis.

CASE 4—This case history illustrates a large mandibular deficit resulting from a gunshot injury that was complicated by diabetes. A 38 year old accountant had become despondent over his inability to control his diabetes, and he had attempted suicide in January 1952 by firing a rifle bullet through the lower portion of his face, destroying the symphysis of the mandible and approximately one third of the anterior portion of both mandibular horizontal rami. On previous admissions to the hospital he had undergone closure

Fig. 9—Case 4. Extensive anterior defect of mandible from gunshot wound

of the soft tissue injuries and treatment for his diabetes. Except for the residual traumatic defects and the labile diabetes, the patient's past medical history was essentially negative.

Examination showed an obvious deformity of the lower third of the face, with considerable scarring of the lower lip and chin. Examination of the oral cavity disclosed two mandibular bony fragments which had independent motion and were collapsed in the midline by contracture of the soft tissues in the anterior portion of the mouth. The right fragment contained two mandibular molars and the left, one molar tooth. The remaining maxillary teeth were in poor repair but were retained for purposes of intermaxillary fixation. All other physical findings were essentially noncontributory. Extensive laboratory studies indicated an uncontrolled diabetes mellitus, and the patient was referred to the endocrine and metabolism unit of the hospital for management of the condition.

Fig. 10—Case 4. Expansion splint used to reposition and stabilize mandibular fragments

Roentgenographic examination of the mandible revealed an extensive defect (Fig. 9). The anterior portion of the mandible was absent bilaterally as far back as the molar regions. The patient's first problem was the control of his diabetes for a period of one month. During this time a mandibular splint was constructed and inserted in order to expand the mandibular fragments gradually to their

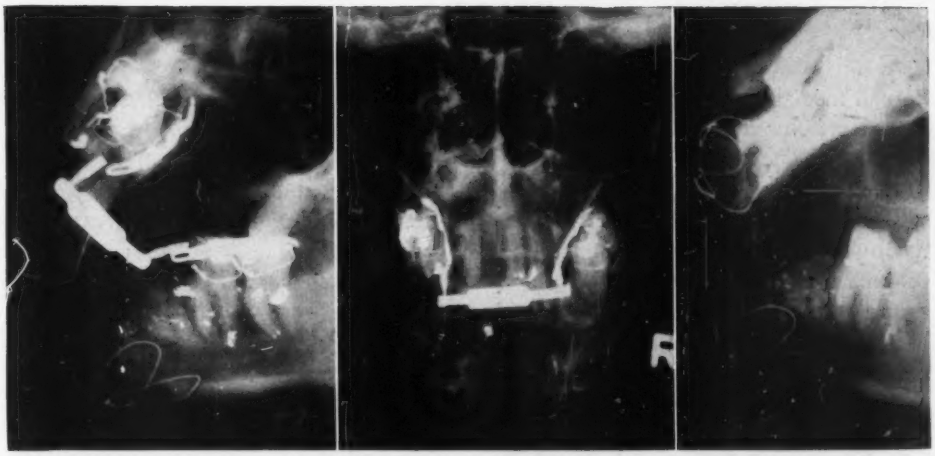

Fig. 11—Case 4. Left and center: Iliac block graft wired in place with splint in position. Right: Union of graft three months after operation

Fig. 12—Case 4. Above left: Deficient anterior sulcus. Above right: Sulcus extension and oral rehabilitation. Below: Dentures in place

normal medial-lateral relationship and to fix them in position for future grafting (Fig. 10). The splint, which had been ligated to the lower molars, was tolerated well and satisfied its objectives of fragment positioning and stabilization. The patient's diabetes came under fair control over a period of six weeks. At this time, under general anesthesia, an incision was made in the submental region to prepare a bed for the large mandibular graft. The dense scar tissue in the region was excised, and the surfaces of the mandibular fragments were prepared for contact with the graft. The iliac crest provided an adequate block section cancellous graft with a mental prominence for replacement of the defect. This graft was wired in place directly with four 25 gauge stainless steel transosseous wires (Fig. 11, left and center).

The patient's postoperative course was satisfactory except for periodic episodes of unstable diabetic status. He was discharged two weeks after the operation, and the splint and intermaxillary immobilization were maintained for a period of eight weeks. The mandibular splint was removed three months after the operation, and roentgenograms revealed a satisfactory position of the bone graft (Fig. 11, right). At this time the patient was admitted for correction of a deficiency in the labial mandibular sulcus (Fig. 12, above left). The operation for extension of the sulcus followed the Kazanjian procedure, and a satisfactory result was obtained (Fig. 12, above right). After complete restoration of the body of the mandible through the graft procedure and the extension of the sulcus, the patient was ready for dental prosthesis. The remaining maxillary dentition was removed, and the mandibular molar teeth were retained for stability of the lower appliance. Final dental prosthesis was inserted six months after the bone graft procedure (Fig. 12, below).

■ *Discussion*

The cases presented emphasize the importance of proper preparation both of the patient and the operative site before grafting. Any active infection must be completely eliminated and prophylaxis provided against complications of infection by adequate antibiotic coverage. Preparation of the graft area includes provision for adequate soft tissue coverage without tension and the removal of avascular scar tissue and sclerotic bone from the graft bed. Complete fixation and prolonged immobilization are paramount for a successful procedure. The requirements of the mandibular graft will determine the choice of chip or block section autogenous iliac grafts.

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Implant dentures

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The term "implant denture" as currently used refers to a replacement for missing teeth which achieves its stability and retentive quality through attachment to a framework of metal or other inert material embedded in the tissues of the jaw. For the sake of brevity, only the complete implant denture, which replaces all the teeth in one dental arch, is considered in this paper.

For the majority of the patients for whom they are constructed, conventional complete dentures are an acceptable substitute for natural teeth. The rest of the patients have difficulties with their prostheses, varying from mere annoyance to injury, inflammation and mutilation of the supporting structures. It is for this group of patients that the implant may be of great value. The conventional complete upper denture is generally worn with greater success than the lower, since its broad surface lends itself to the retentive and stabilizing factors of adhesion and atmospheric pressure. These features are much less effective in mandibular dentures, which have a smaller base area.

It is truly remarkable that conventional complete dentures function at all, since they have no structural attachment to the jaws. The purpose of implant dentures is to provide this element of rigid fixation. This purpose is accomplished by seating the "superstructure" or tooth-bearing component on a series of parallel posts which emerge through the oral mucosa from the embedded framework. Thus, in principle, the denture proper functions as a conventional removable partial replacement. The implanted base involves a radical departure from orthodox concepts.

The actual status of developments and technics at the present moment is far from clear. As so frequently happens in any field of human endeavor, empirical activity has outrun the scientific. Whereas a common motivation has impelled a number of practitioners to plunge into the treatment of human subjects with a score of different technics, the laboratory and statistical data are scanty, and case studies still cover periods too short to present conclusive evidence.

■ *Indications for Use of Implant Dentures*

It would seem prudent at this phase of development to limit implant dentures to cases which present serious prosthodontic problems, that is, to two groups of patients: (1) edentulous patients with essentially normal mouths except for pro-

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nounced resorption of alveolar ridges and (2) patients with mutilations of the mouth and jaws due to congenital defects, injuries or deformities following surgery for the eradication of neoplastic disease.

Most of the patients for whom implant dentures are placed at the present time belong to the first group. These patients often complain that they have had numerous sets of teeth made without gaining comfort and satisfaction.

The problem presented by the second group of patients is a great challenge but has received relatively little attention to date. Replacement of teeth for patients who have uncorrected cleft palates, macroglossia or pronounced disharmony of jaw relation has heretofore been a superhuman task for the dentist. Loss of a portion of the mandible from traumatic injuries—especially war wounds—, osteomyelitis and cancer also has offered an extremely difficult prosthetic problem. Loss of oral tissues and extensive scarring are major obstacles to reconstruction. The principle of the implant denture largely by-passes these difficulties.

■ *History*

Since antiquity, efforts have been made to replace missing teeth with substitutes that would be rigidly fixed to the jaw. Petronius attempted the closure of a cleft palate with a gold obturator in 1565.[1] In France, single-tooth replacements of gold were attempted by Maggiola in 1809, and of iron by Rogers in 1845.[2] The first account in American literature of the use of lead for such replacements was published by Harris in 1887.[3] Two years later both Edwards[4] and Berry[5] tried lead for one-tooth substitutes. Bonwill in 1895 reported the use of gold and iridium for the same purpose.[6] Greenfield advocated the use of iridioplatinum in 1913.[7] More recent work indicates that failure to achieve permanent attachment was due to one of three factors: reaction of the tissues to the metal, infection immediately after placement, or loosening as a result of trauma in occlusion.

A milestone was passed in 1936 when Venable, Stuck and Beach[8] experimented on a patented chrome-cobalt dental alloy called Vitallium. Their studies indicated that among all metals tested Vitallium was the only one which produced no electrolytic action when it was buried in the tissues. In the same year this substance was embedded in human tissues for the first time in the form of screws, stabilizing fragments in a fractured long bone. The result was highly successful.

Since then Vitallium has been placed in the tissues countless times in a variety of forms, including among others, screws, tubes, plates and artificial joints.[9] As yet certain physical characteristics of other metals commonly buried in the body tissues—certain stainless steels and tantalum, for instance—have made their use imprac-

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tical for the framework portion of the implant denture. In 1952 Flohr,[10] of Germany, described one case in which the framework and posts were constructed of acrylic resin. Properties of this material would seem less suitable to the present technic than the chrome-cobalt alloy.

In 1937 a Texas dentist attempted a root type of implant made of Vitallium. Other experimenters used various shapes and designs for the single-tooth implants.[11] Within four or five years, however, interest waned. It appears that these Vitallium replacements were not successful probably because of mechanical factors.

Three implant bases were placed by a practitioner in Sweden in 1939.[11] As far as is known, these were the first complete-denture implant bases attempted. All three were placed on the maxilla, and all were failures.

Bernier and Canby[12] in 1943 reported on the implantation of Vitallium screws in the tooth sockets of dogs and also through the skin into the lower border of the mandibles of the same animals. Histological study showed that the intraoral implants which were entirely covered with mucosa produced no reaction whereas those passing through the skin were surrounded by some evidence of inflammation.

In 1946 Skinner and Robinson[13] reported on their experience with an upper transalveolar Vitallium tube and pin device for securing complete upper dentures. Although a later article reaffirmed their enthusiasm for the appliances,[14] final reports on their results have never been published. These experimenters apparently did not apply the principle to mandibular prostheses.

In 1949 Goldberg and Gershkoff[15] reported on their technic for a complete lower implant denture. Their method, with considerable modification, is the one used by most workers at the present time. The number of cases in which they have used their technic has now reached 54; only 4 of these were failures.[16] In the latter instances the implants were fabricated without a direct impression of the bone and presumably lacked sufficient stability.

From the history of experimentation with implant dentures, it appears that implantation of metal denture bases with posts protruding into the mouth have been somewhat successful. The degree of success cannot be estimated exactly largely because sufficient time has not elapsed for adequate observation of the results. Even an ardent skeptic is forced to admit, however, that some implants remain within the mouth in a clinically healthy condition and, furthermore, that some of them have remained in this condition for five years and many more for shorter periods. Such evidence merits consideration. At this time the place of implant dentures in dentistry is justifiably subject to debate, which, however, should not be allowed to detract from the progress that has been made. The results al-

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ready obtained justify continued study, experimentation and research.

In attempts to explain the functioning of an implant denture, theoretical considerations predominate. A cursory discussion would give the impression that retention for any length of time is impossible and that exfoliation and failure are inevitable. Yet this has not been the usual result up to this time. The success or the failure of implant dentures depends on four major factors.

■ *First Consideration*

The qualities of the material which is to be used as the base must be suitable for the anticipated requirements of the prosthesis. The physiological and physical attributes of Vitallium make it the material of choice at this time. There is at present no evidence that cancer occurs with any greater frequency in the tissues adjacent to an implant denture base than it would occur if the base were not present.

■ *Second Consideration*

The post region is a crucial point in the discussions of the subperiosteal dental implant. Obviously, without the uncertainty in regard to this point and also in regard to the mechanical factors of occlusion, the procedure would differ little from the many other implantation methods which have been tried and accepted since Vitallium was developed. Loechler and Mueller,[17] in the only published report of a biopsy from the post region of an implant denture in a human subject, found the microscopic appearance similar to that of the normal tissue. One of the authors of this article (M.L.W.) in a similar biopsy found evidence of cellular infiltration, a condition not uncommonly observed in clinically healthy gingivae.

The uncertainty of the role of the tissue around the emerging posts leads to some fear that this tissue may provide an easy route for the entrance of bacteria and infection into the deeper structures. Tooth transplantation and replantation have been performed repeatedly; the epithelial attachment has been completely separated, and the mucoperiosteal flaps have been raised in countless mouths. These procedures almost universally have resulted in clinically normal reattachment of the gingiva. Rarely does a channel of infection develop.

The previous concepts of epithelial attachment to the enamel and cementum seem to be incompatible with many clinical observations. There may be one or two explanations of this process. If there is an organic epithelial attachment as claimed by many histologists, then there must be a reforming of this attachment. This phenomenon appears possible in the cases mentioned but highly improbable in cases where metallic foreign bodies are used. A more logical explanation might be that there is no actual organic attachment of the epithelium to the post or tooth. Rather, there may be simply an adhesion of the superficial cells to the protruding surface. This explanation is not meant to imply that there is no connective tissue attachment in the case of natural teeth, for attachment by periodontal fibers has been adequately demonstrated.

The adhesion of the epithelium

17. Loechler, P. S., and Mueller, M. W. Successful implant dentures. North-West Den. 31:134 July 1952.

could be brought about by a cufflike action of the surrounding mucosa. The efficacy of this mechanism would be greatly enhanced by the other defenses of the oral cavity, such as the mechanical, diluent and bacteriostatic action of the saliva, the alarm system of odor and taste, and the local defense mechanisms of any body tissues. In other words, the material that protrudes may be unimportant provided that it is compatible with the tissues. Whether this is an erupting tooth, a transplanted tooth or a metallic post, the epithelial reaction may well be the same: a passive adhesion.

A study of the literature pertaining to the periodontium has revealed no conclusive evidence that there is an appreciable organic attachment of the epithelium to the tooth. Microscopic evidence of proximity does not constitute proof of attachment. Conclusions based on degree of drying or fixation of the specimen may be erroneous.

Jens Waerhaug[18, 19] recently completed some excellent and extensive work concerning the gingival pocket and epithelial attachment. Though none of his research was associated in any way with metal dental implants, the clinical results from denture implant bases provide surprisingly strong indirect support for many of his conclusions on the natural dentition of human beings and animals. Some of Waerhaug's observations and conclusions, which theoretically may apply also to the post regions of implanted denture bases, were as follows:

1. Clinically normal-appearing gingival pockets of both dogs and human beings were nearly always sterile.

2. When pure cultures of pathogenic bacteria were inserted into healthy, sterile pockets, an inflammatory process with a gingival exudate developed. The pockets were free from bacteria again within 48 hours.

3. It was possible to obtain sterile pockets around artificial metal, acrylic and porcelain crowns.

4. When the epithelial attachments of teeth were detached post mortem and then replaced, the microscopic picture appeared to be that of a normal attachment. It appeared, therefore, that microscopic evidence could be erroneous.

5. When unfixed specimens were used and thus the desiccation factor was removed, layers of epithelial cells adhered to the enamel and artificial crowns, including metal crowns. This adherence could not be considered as organic union, since it was so weak that the layers were washed away with a tiny stream of water or removed with a light wisp of a brush of camel's hair. The strength of adherence to the artificial crowns was apparently as great as that to the natural teeth. Waerhaug felt justified in concluding that the layers of cells were attached in the same manner.

6. Many facts indicated that conditions around an artificial crown or pontic root extending below the gingival margin can appear just as ideal as those around a natural tooth.

7. The designation "epithelial attachment" should be replaced by a term such as "epithelial cuff." The tightening of this cufflike attachment prevents the

18. Waerhaug, Jens. The gingival pocket. Odont. Tskr. 60:Suppl. 1, 5, 1952.

19. Waerhaug, Jens, and Steen, Emil. The presence or absence of bacteria in gingival pockets and the reaction in healthy pockets to certain pure cultures. Odont. Tskr. 60:1, 1952.

body tissue fluids from escaping readily and the bacteria from penetrating into the tissues.

These observations of conditions around the teeth are important because they provide some indirect evidence that a similar situation could conceivably exist around an implant post. If the so-called attachment is nothing more than an epithelial cuff, its action would be almost as efficacious around a metal post or crown. If the clinically normal gingival mechanism is a simple adherence of some spent epithelial cells and the cufflike action of the mucosa and if the function of this pocket allows for the ridding of pathological bacteria by dilution, mechanical washing and the body defenses, a similar action could exist in connection with implants. This manner of functioning might help to explain why the dreaded contamination usually does not materialize.

Because of the relation of the encircling tissues to the post, an implant probably would not be as successful outside the mouth, or, more specifically, where mucosa was not involved. The soft moist consistency of mucosa together with the other characteristics of the oral cavity are factors that do not exist on the skin surface. In addition, the skin is somewhat desiccated and cornified and of a less pliable nature so that an implant through the skin might be hazardous. The absence of any active tissue over the alveolar ridges because of the firm attachment of the mucoperiosteum to the bone and the lack of any muscle fibers seem additional advantages for the intraoral procedure.

The analogy of a metallic post to a natural tooth cannot be carried too far, for it has been observed in the laboratory animal that epithelium will grow down along the surface to a depth of 4 to 8 mm. and conceivably might continue until the entire metallic implant was "exteriorized." Flohr[10] reported the same observation with acrylic posts and screws. In the natural tooth epithelial downgrowth terminates at the circular ligament and transseptal fibers of the periodontal membrane. In certain pathological conditions, however, downward proliferation does occur in natural dentition.

■ *Third Consideration*

The third consideration concerns the effects of an implant base on the osseous tissue. Some generalizations can be made on the basis of implantations elsewhere in the body, even though in these implantations certain mechanical factors do not play a part as they do in dental implants. It has been demonstrated frequently in the investigations of the authors and of others that fibrous connective tissue proliferates completely around the imbedded portion of the appliance. This dense connective tissue likewise appears below the metal. It separates the bone from the implant and forms in spite of the fact that the implant is placed directly on bare bone and in spite of the use of such primary means of retention as screws or wires.

An extensive review of the literature on arthroplasties with metal leads one to believe that the surrounding tissues and especially the underlying membrane might not remain static under the forces applied in mastication. It is the opinion of the authors, although without complete substantiation, that a modified type of joint structure will eventually form between the bone and the metal base. This

opinion stems from study of the reaction of the body to stresses and loads.

Without at least the connective tissue reaction which has been demonstrated around the embedded frame, it would appear certain that the underlying bone would undergo resorption. Actually the gross determination of bone loss has not been presented by any previous writers. Ochs[20] relates that one of his patients has had periodic encephalometric examinations and tracings of his mandible since the placing of an implant denture and that no detectable bone loss has been demonstrated in three years.

Observations of the bone markings beneath the implant bases of dogs was one of the most enlightening phases of this study. There is abundant reason to believe that a similar settling of the metal base would occur also in a human jaw. Such a shifting of the base might not be progressive in character but possibly would be merely the manifestation of the condensation of the structural components of the bone. If this should be the case, the minor early discrepancies which occur in the occlusal and centric relations could be corrected and observed. If the condition continued throughout any period of use, a more serious situation would result, depending on the rapidity of the settling process. Although a considerable amount of bone resorption occurs under an orthodox denture, the presence of this resorptive process alone is not sufficient to condemn the entire principle of implant dentures. If the bone adjustment continues but is not excessive, frequent corrections of the superstructure may be adequate to prevent any serious sequelae from this process.

The bone reactions are proof that bone structure undergoes rapid and striking changes from a great variety of influences. This fact is important, since the concept of the implant denture is based on the principle of the utilization of a mature, stable foundation, that is, bone, which in reality is far from stable. A misplaced confidence in the stability of the foundation may prove a greater handicap to successful implant dentures than the reaction of the peripostal tissues. As yet it has not been possible to make a complete, accurate study of the tissues surrounding an implant denture, exposed to all the forces active in the human mouth.

■ *Fourth Consideration*

The fourth consideration is the product of the previous three—the success or failure of the implant denture. If a "normal" situation can be established which permits physiological function without deleterious effects, then the next logical question is how far variations can be made from this "norm" before a pathological condition ensues.

Factors which produce pathological conditions in the periodontal tissue of the natural dentition may prove equally deleterious to the peripostal tissue of an implant base. If similarity of basic physiology of tissues in both instances can be assumed to account, in part, for the success of dental implants, then it is logical to assume that conditions which make for abnormal periodontal conditions can account for the failure of the dental implants. Calculus does form to some degree

20. Ochs, J. Personal communication, March 1953.

on the exposed metal. The question arises as to whether it will occur as extensively as around teeth and whether pathologic gingival pockets will form.

Additional local factors, such as poor oral hygiene, bad habits, mouth breathing, smoking, chemical irritants, malposition of teeth, occlusal trauma and specific bacteria, may, in themselves or superimposed on systemic conditions, be important factors in maintaining or preventing a healthy state of the tissues in the post regions. If all these factors play a part, then it must be determined to what extent each factor may depart from "normal" conditions before it will cause the implant to fail and contraindicate the placing of the implant.

Other questions, still unanswered, concern the supporting structures. No one knows yet what are the "normal" stresses and strains for an implant. It is unscientific to apply *in toto* all the principles of conventional prosthetics to implant dentures. Up to now, it has been necessary to do so, since there is no other familiar base from which to start.

Certainly, many principles of conventional replacements will apply to implants. The problems presented by the structure of the oral cavity, the forces of mastication, food intake and other factors are similar for the dental implant and for conventional prostheses. There are also additional factors which are completely dissimilar to any previously coped with. For instance, in the case of unilateral palatal defects, the following problems arise: Can the unaffected side be used for the base with the superstructure extending over the defective region? Would this situation create unfavorable lever action which might work to the detriment of the entire appliance? How much use can these implants be subject to and still function satisfactorily? All these are difficult questions to answer, since the physiological optimum, if one exists, is not known.

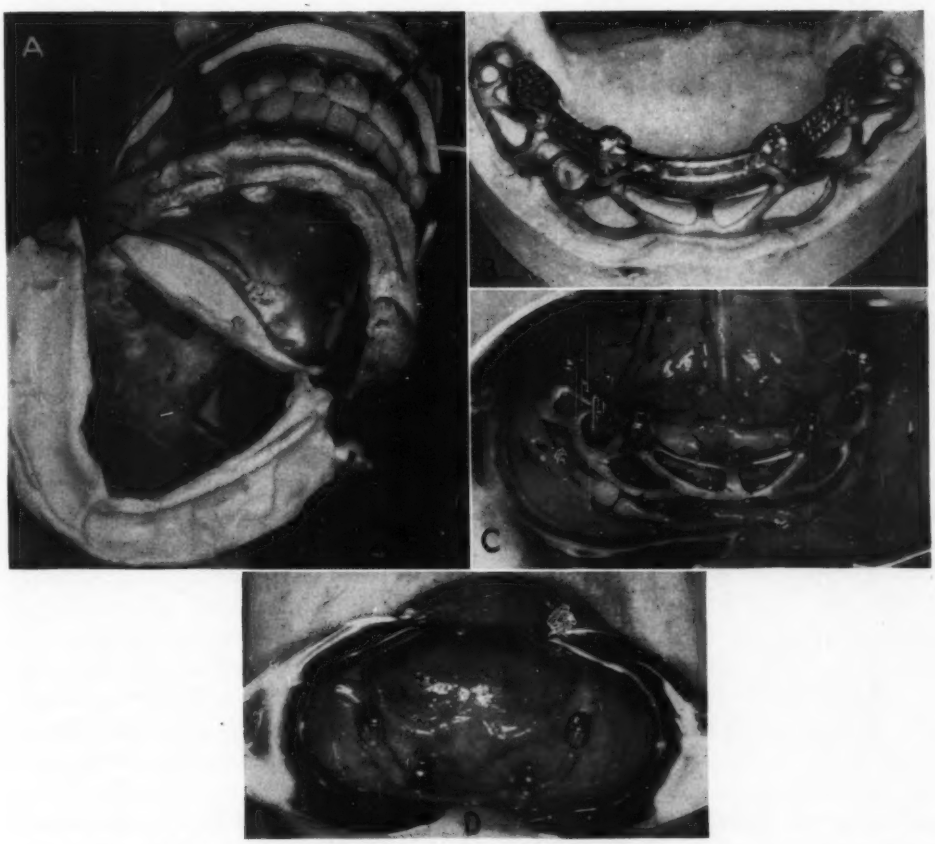
■ *Technic*

The procedure described in this article has been used in a small number of cases with gratifying results. The method is a combination of several well-known methods with some slight modifications. The steps in the procedure are as follows:

1. The complete denture is set up in wax, as shown in part A of the illustration. Thus, the occlusal plane is established, the relation of the teeth to the ridge is fixed, and the position and length of the post are accurately determined. The teeth must be of acrylic resin so that they can be ground readily later for the reception of the metal superstructure.

2. The ridge is prepared surgically for the impression by raising lingual and labiobuccal flaps from the third molar region on one side to the third molar region on the other side. The bone is smoothed to eliminate all spines and undercuts. Several transverse grooves are made with a fissure bur to provide a seat for the implant and also to provide a recess for transverse struts of metal.

3. The impression of the alveolar bone for the implant is taken with modeling compound or with a compound and a wax material. Alginate, hydrocolloid or zinc oxide pastes should not be used, as they may become enmeshed in the tissues.



A: Articulator and dentures at trial stage. B: Stone model with implant frame. C: Implant base seated on exposed bone. D: Apearance three weeks after insertion of implant

A specially prepared, narrow, acrylic tray should be disinfected and used for the impression. At this time a somewhat less accurate impression, including the lower trial denture, also is taken with low-fusing wax.

4. The surgical wound is closed.

5. A stone model is poured, the implant is designed, and the design is sent to a laboratory along with the trial dentures for construction of the Vitallium implant and metal superstructure (illustration, B).

6. The implant is inserted three to four weeks later (illustration, C). The wound is reopened through the same incisions. The transverse grooves are cleaned. The framework should fit in place just as a well-made inlay. Screws are not used to secure the framework in any of these cases. The mucoperiosteal flaps are sutured with care to avoid inverting any

epithelial margins. Special attention is given to the post region; great care is used in the excision of the mucosa and the placement of mattress sutures.

7. The sutures are removed in five to seven days (illustration, D). The balance of the procedure is carried out in accordance with established prosthetic technic. The metal superstructure used thus far consists of four precision caps to fit the posts, united by a communicating bar of the same metal. The previously constructed trial denture is adapted to this metallic framework by judicious grinding of the acrylic teeth. When the metal superstructure has been incorporated in the trial denture, this unit is placed in the mouth for verification of occlusion and bite. The denture is then processed in acrylic resin and finally placed in the mouth.

■ *Discussion*

The technic described has reached its present form through various modifications. The surgical and prosthetic procedures are not prohibitive in extent. The necessary surgery consists chiefly of two separate complete mucoperiosteal flap operations. Sound surgical and prosthetic principles must be observed. The surgical technic should not differ greatly from that of placing a bone graft, a fracture plate of metal or other established procedures. The prosthetic technic is somewhat less definite, since many problems remain unanswered; however, sound prosthetic principles provide an accurate evaluation of any changes to be attempted.

Implant dentures should not be used to compensate for faulty and inadequate technics. On the contrary, utmost vigilance is imperative. The metallic base must fit the bone accurately and include a substantial region of the jaw. The adaptation of the base depends largely on the direct impression of the bone. If the base is unstable, mechanical factors may jeopardize the results. Poor adaptation to the bone has been the cause of most of the failures reported. Once a well-fitting metallic base is correctly placed, sufficient healing for primary retention takes place in approximately three weeks.

The reaction of the surrounding soft tissues to metal is comparable to that of alveolar bone. Primary healing, while most desirable, is not mandatory provided that the structure is stable and firm. Even if wound edges pull away and leave large areas of exposed metal, with proper oral care granulation tissue will proliferate from beneath and around the base, and the surface defect will usually close completely; healing thus takes place by second intention. This type of healing usually occurs in spite of inevitable oral contamination.

In one instance the wound separated after placement of the implant, possibly because of excessive tension on the sutures. The mucosa finally grew under the implant, exteriorizing this portion of the framework, which then began to accumulate calculus. Since the seating was solid and firm, it was decided to leave the implant in position; the patient is now contentedly wearing the completed denture. In the first of these cases, a hydrocolloid material was used for the bone impression, with nearly disastrous results. An infinite amount of difficulty resulted from the intermingling of the material with the tissues; it is quite possible that some of it

was never removed. In this case the flaps were very slow in healing over the implant.

The mental nerve is often observed to be emerging on the crest of the ridge and should be shielded from pressure by arching the structure of the implant carefully over or around this region.

The chronological age of the patient for the most part is of secondary importance. If the patient has a real need for the service and is in good physical condition, there should be no reason for rigid specifications as to the age limit.

In some pathological conditions the procedure may be indicated for children. Up to the age of five or six, the growth of facial bones takes place largely on the surface. The process then shifts to certain growth centers. Placement of an implant prior to the age of six years would seem to be absolutely contraindicated. Disturbance of the periosteum and the blood supply and direct trauma to the bone could conceivably distort the surface growth. After the surface growth has been completed, there seems to be little reason why an implant cannot be placed safely and effectively. Frequent adjustment and remaking of the denture proper are required so that growth will not be impaired by mechanical interference of the external appliance.

At the present time contraindications to the use of the implant denture are multitudinous. A psychologically unstable, highly critical or unreasonable type of patient is unlikely to achieve satisfaction even though the result is successful from a technical point of view.

The patient's reaction to implant dentures is usually favorable. This factor is important, for without public approval little can be expected of any such development despite its merits. The demand of the patient for the denture, however, is not the primary indication for its use.

This type of prosthetics requires team activity. An oral surgeon, a prosthodontist and a laboratory technician all play vitally important roles, but one of these must assume over-all responsibility and direction of the treatment. No one phase of the technic is more important than any other, but it is of the utmost importance that all phases be coordinated harmoniously for the best possible result.

■ *Summary*

The implant denture should be restricted to patients for whom satisfactory conventional dentures cannot be made.

Metal implants of various types have been used for many years. The development of Vitallium has given impetus to experiments with dental implants. The success or failure of implant dentures depends on the material used, the reaction of the post region to the implant and the effect on the osseous tissues.

The well-known procedures of placing implant dentures were modified to produce a procedure which has been tried in a small number of cases. In all these cases the implants have been successful. Sufficient time has not elapsed, however, to determine the practicability of the implant denture.

Untoward reaction to Efocaine:
report of case

■ *Harry M. Seldin, D.D.S.; S. Daniel Seldin, D.D.S.; William Rakower, D.D.S., and Abbe J. Selman, D.D.S., M.S., New York*

The need for a local anesthetic with a prolonged action has been recognized for some time. Such an anesthetic is of importance to the dentist for the alleviation of the following: (1) persistent pain and discomfort which may follow oral surgical procedures; (2) pain of trigeminal neuralgia, and (3) pain resulting from a malignant growth or its treatment. There are certain requirements for a prolonged action local anesthetic. In general, they are the same requirements demanded for any local anesthetic; namely, ease of administration, effectiveness, low toxicity, compatibility with the tissues, safety of administration.

Efocaine, a long-acting local anesthetic, is a solution of 1 per cent procaine, 0.25 per cent procaine hydrochloride, and 5 per cent butylaminobenzoate in a solvent composed of 2 per cent polyethylene glycol—300, 78 per cent propylene glycol, and water. It has been publicized widely and has been used fairly extensively by medical anesthesiologists. It is likely that, owing to its advertisement in the dental literature and as the result of the advertisement of similar compounds, its use may increase in dentistry as well.[1]

Clinical evidence from case reports published in recent months have, however, indicated that the use of Efocaine is not without danger. Shapiro and Norman[2] reported serious neurological symptoms which developed and persisted in three cases after the use of Efocaine. Bonica,[3] reporting his experiences in the use of Efocaine in 100 patients, stated that in six instances postinjection neuritis and pain ensued. There have been other reports of "perirectal sloughs, unilateral anhydrosis, severe neuralgia persisting for weeks, postinjection neuritis and pain, long lasting and probably permanent motor paralysis of the lower extremities and atonic bladder."[4] Monheim[5] found that in four out of five cases in which he employed the drug, there was some degree of tissue destruction with sloughing. Recently a fatality was reported after the use of Efocaine.[4]

The following case is presented in order to report a serious and acute episode after the injection of 1.5 cc. of Efocaine in the pterygomandibular space.

REPORT OF CASE—On April 10, 1953, a deep horizontally impacted lower right third molar was removed with some surgical difficulty from the jaw of a 30 year old dentist who was in good health. When the lidocaine injec-

1. Open forum. Modern dentistry 20:28 Oct. 1953.
2. Shapiro, S. K., and Norman, D. D. Neurological complications following use of "Efocaine." Report of 3 cases. J.A.M.A. 152:608 June 13, 1953.
3. Bonica, J. J. Management of intractable pain with analgesic blocks. J.A.M.A. 150:1581 Dec. 20, 1952.
4. Angerer, A. L.; Su, H. H., and Head, J. R. Death following use of Efocaine; report of case. J.A.M.A. 153:550 Oct. 10, 1953.
5. Monheim, L. M. Personal communication.

tion had worn off the patient felt persistent discomfort and pain. Three days later the pain had increased considerably. After a successful block of the right inferior alveolar nerve, using lidocaine without epinephrine, 1.5 cc. of Efocaine was injected into the same location, using an aspirating-type syringe. The Efocaine injection was given at 12 noon on April 13. Pain relief continued, and the patient experienced the typical symptoms of an inferior alveolar nerve block. At 5 P.M. sensation began to return and at 6 P.M. the patient began to have pain. The pain became progressively worse, finally becoming extreme at about 7 P.M. The pain which the patient felt at this time was much more intense than the pain for which the Efocaine had been given originally. Trismus set in at about 7:30 P.M., and at approximately 8 P.M. the patient experienced a stiffness of the neck with inability to rotate the head. This was accompanied by a relative dysphagia. By 9 P.M. the patient was bedridden and could not move his head at all. Deglutition had become even more difficult, and the patient now felt some respiratory difficulty. The respiratory embarrassment did not appear to be related to diaphragmatic or intercostal dysfunction, however; it consisted mainly of dyspnea with shortness of breath which the patient later related to anxiety. Chills began at about this time, associated with a noticeable pallor and general malaise. There was marked perspiration without increased body temperature. At 10 P.M. the eyes began to tear excessively and the patient experienced tremendous apprehension. At 11 P.M. he administered to himself 1/6 grain morphine sulfate and 100 mg. diphenhydramine hydrochloride because of fear of an allergic reaction. At about midnight, he began applying external heat to the right side of the neck and the submandibular area. By this time the pain had diminished somewhat after the use of the morphine and at 1:30 A.M. the patient fell asleep after the self-administration of ½ grain codeine sulfate. He maintained the heating pad in position through the remainder of the night. The next morning he felt considerably improved, and the remainder of the symptoms slowly disappeared over a period of a week.

DISCUSSION—In the case reported, it is unlikely that the anesthesia of the right inferior alveolar nerve produced by lidocaine without epinephrine lasted more than one to two hours. The fact that the patient had symptoms of anesthesia of the right inferior alveolar nerve for a five hour period indicated that the Efocaine had been correctly deposited.

It is our opinion, however, that at the end of that time the pain which the patient began to experience was the result of a progressive neuritis caused by the Efocaine. The trismus which followed the onset of pain further suggests a myositis of the internal pterygoid muscle induced by the presence of Efocaine in the pterygomandibular space. Stiffness of the neck developed and inability to rotate the head which seems to indicate involvement of the neighboring fascial spaces with a possible fascitis and myositis of the sternocleidomastoid muscle. The remainder of the symptoms are suggestive of a mild, transitory shock and hysteria.

The procaine and butyl-p-aminobenzoate in Efocaine are crystalline, slowly absorbed substances which are insoluble in water; however, they are readily soluble in the solvents used in Efocaine. The solvent is said to be eliminated within 24 hours from this crystalline depot. It is significant that the most acute symptoms lasted almost 24 hours. Since the solvent is supposedly excreted within a 24 hour period, it appears reasonable that the solvent may be implicated in this acute, postinjection episode.

SUMMARY AND CONCLUSION—An acute episode, characterized by neuritis, fascitis and myositis accompanied by transitory shock occurred several hours after the injection of 1.5 cc. Efocaine into the pterygomandibular space.

Because of the unfavorable reports in the medical literature and the undesirable side effect described in this report, the employment of Efocaine for pain relief in dentistry is questionable.—57 *West Fifty-seventh Street.*

Tuberculosis of mandible:

report of case

■ *Conrad J. Spilka, D.D.S., Cleveland*

Tuberculosis of the mandible is extremely rare. The tuberculous lesion may occur in both the soft tissues and the bony supporting foundation structures of the mouth. It is generally agreed that oral lesions are usually a manifestation of a pulmonary involvement. Rubin[1] and other writers claim that there are no primary tuberculous lesions of the mouth. Tannenberg[2] states that evidence of primary lesions can be accepted only if a history of pulmonary tuberculosis is excluded by tomographic examination. The mandible shows a greater predisposition to the infection than the maxilla. Bony involvement is thought to be due to extension from the investing soft structures, although in the case to be reported herein there was no evidence of any soft tissue lesion. Since secondary infection occurs rather early in tuberculosis of the jaw, it often is difficult to prove that the disease is actually tubercular in origin. Frequently, it is only after a biopsy has been taken that a definite diagnosis can be made.

HISTORY—A negro man, aged 20, was seen July 7, 1947. In April he had first noticed an enlargement of the left side of the mandible, general malaise, severe generalized headaches and weakness. This was sufficiently severe to require bed rest on several occasions during April and May. On June 6, he had awakened with a severe generalized headache which had lasted for 24 hours and was accompanied by general malaise, nausea, vomiting, chilly sensations of short duration, fever and weakness. From June 6 to 12 he had wakened each morning with a severe generalized headache accompanied by dizziness that had persisted if he did not remain quietly in bed. Despite treatment by his family physician, the general malaise and fever had persisted. On June 12 he was admitted to his local hospital. The physician who treated him at the hospital reported that he was admitted because of pain of the arms, legs and head, accompanied by a temperature of 103° F. The temperature usually increased during the day until it had reached 103° F. between 4:00 and 8:00 P.M. This was followed by a marked remission in the morning, but the temperature never returned to normal. Blood culture, serology, urinalysis, roentgenograms of the chest, agglutination test for typhoid fever and undulant fever were all negative. Leukocyte count was normal. No obvious pathologic condition was found, but "the ordinary routine of penicillin and streptomycin, plus a couple of injections of Mapharsen" had been carried out without effect. None of these seemed to alter the clinical course of the illness. After losing a total of 37 pounds, the patient was admitted to the Crile Veterans Administration Hospital for diagnosis and treatment.

The past history was noncontributory, with a record of only the usual childhood diseases. His parents were living and well, and there was no history of tuberculosis in the family. There was no history of cough, hemoptysis or precordial pain.

PHYSICAL EXAMINATION—The patient was obviously underweight when admitted, since he weighed only 128 pounds. There was a soft, round mass measuring 1 cm. in diameter on the upper right eyelid. It appeared to be a typical chalazion. There was a small, hard

Consultant in oral surgery, Crile Veterans Administration Hospital, Cleveland, and Veterans Administration T. B. Hospital, Brecksville, Ohio.

1. Rubin, E. H. Tuberculosis of the buccal mucous membrane. Am. Rev. Tuberc. 16:39 July 1927.

2. Tannenberg, J. Tuberculosis of the oral cavity. New York J. Den. 13:301 Oct. 1943.

Fig. 1—Preoperative photograph showing mass along lower border of mandible

mass, 1 cm. in diameter, fixed to the underlying bone in the posterior third of the left side of the mandible (Fig. 1). The blood pressure was 102/48; pulse, 88; temperature, 103° F.

LABORATORY STUDIES—Admission serology was negative. Urine tests were negative. The red blood cell count was 2,800,000; white blood cell count was 7,300, with 58 per cent hemoglobin. Agglutination tests for brucellosis and tularemia were negative.

ROENTGENOGRAPHIC EXAMINATION—Stereoscopic and fluoroscopic studies of the chest revealed a homogeneous density along the right paramediastinal region above the level of the right hilus. The margins of the density were rather sharply delineated and appeared somewhat lobular in contour. These were thought to be due to an inflammatory process or an enlarged lymph gland. A lateral roentgenogram of the left side of the mandible disclosed a rhomboid area of rarefaction that involved

Fig. 2—Preoperative roentgenogram showing area of rarefaction

the medullary portion of the mid-mandible which measured 2¼ by 1 cm. There was minimal periosteal proliferation present (Fig. 2).

FIRST OPERATION—On September 5 a biopsy was performed under local anesthesia (2 per cent procaine). The mandible was exposed through an incision beneath the inferior border on the left side of the mandible. The incision extended from the mental foramen posteriorly for 3 cm. A bulging distension in the buccal cortex was removed and the contents of an underlying cavity excised. A large regional lymph node was also removed at that time.

PATHOLOGIST'S REPORT—Gross examination revealed that the specimen consisted of multiple fragments of bone and a lymph node which measured 1.4 by 1.4 by 0.8 cm. The lymph node was cut with slight resistance and revealed a flat, dry, pale gray surface which in some regions was soft and cheesy. Microscopic examination revealed that the tissue was composed of large areas of caseous necrosis which was surrounded by a proliferation of endothelioid cells, connective tissue, lymphocytes, plasma cells, and numerous giant cells of the Langhan's type. There were numerous tubercles, both miliary and conglomerate, composed of endothelioid cells and centrally placed giant cells of the Langhan's type. Acid-fast stains revealed the presence of acid-fast bacilli. Sections taken through the bone revealed that there was destruction of the bone and fibrosis of the marrow. In the connective tissue, there were numerous tubercles composed of centrally

Fig. 3—Postoperative photograph

placed giant cells of Langhan's type, epithelioid cells and a peripheral infiltration of lymphocytes and plasma cells. The diagnosis was tuberculous lymphadenitis and tuberculous osteomyelitis.

SECOND OPERATION—On September 15, under gas-oxygen-ether anesthesia, the mandible was again exposed through the previous incision. A block section encompassing the tubercular portion of the mandible was removed.

PROGRESS—Postoperatively, there was a slight elevation of temperature which became normal on the fourth postoperative day. Except for extreme soreness and tenderness of the left side of the mandible, the postoperative convalescence was entirely uneventful. Immediately after surgery, the patient was placed on a regime of 2.1 Gm. of streptomycin daily for 66 days and 1 Gm. daily for four days, a total

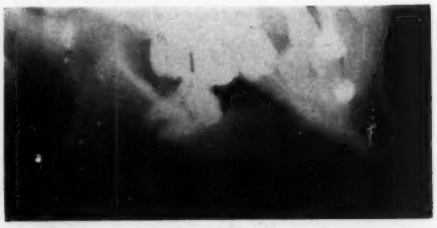


Fig. 4—Postoperative roentgenogram showing evidence of bony healing

of 70 days treatment and 140.6 Gm. of streptomycin. The wound healed promptly and there was no evidence of recurrence of the tubercular infection. The patient remained free of evidence of streptomycin toxicity and was at all times free of symptoms referable to the eighth nerve; however, it was deemed wise to discontinue therapy after 70 days. On November 26 the patient left the hospital and was referred to his physician for follow-up care (Fig. 3). On May 18, 1948, he returned to the hospital for a progress physical examination. Roentgenographic examination revealed evidence of bony healing and no indication of recurrence of the osteomyelitis (Fig. 4). He was then discharged with instructions to return at six month intervals.

SUMMARY—A negro, 20 years old, with tubercular osteomyelitis first came for treatment of a fever of undetermined origin. Previous treatment had included a routine short course of penicillin-streptomycin which had been given without effect. Roentgenographic studies of the chest and routine laboratory studies were negative, but roentgenograms of the mandible disclosed a destructive lesion.

Diagnosis was made by microscopic study of tissue excised from the bony defect. Excision of this tissue combined with heavy dosage of streptomycin for a total of 70 days resulted in clinical and roentgenographic evidence of healing of the region. No recurrence has been noted to date.—*2012 West 25 Street.*

Osteofibroma in the maxillary sinus:
report of cases

■ *E. J. Perint, M.D., D.D.S., L.D.S., R.C.S., London, England*

Osteofibroma is a slow-growing benign tumor composed of fibrous and osseous tissue. It usually occurs in the maxillary bone near the sinuses.

CASE 1—The patient, a woman, aged 32, had pain of the right side of the face that was localized in the region of the maxillary division of the trigeminal nerve. The patient also complained of a mild bleeding from the nostril on the affected side, which occurred at frequent intervals.

Pain, of periodontal origin, was experienced in the region of the bicuspids, particularly the second, which was crowned. Also, this second bicuspid appeared to be loose when the nose bled. There was no roentgenographic evidence of a root canal filling under the crown, and the apical end of the root canal was unusually enlarged (Fig. 1).

Roentgenographic examination disclosed a circumscribed area of osteosclerosis above the apex of the second bicuspid and extending into the maxillary antrum. The periodontal membrane did not show evidence of chronic inflammation and the lamina dura was intact. There was no demonstrable connection between the radiopaque area and the periodontal membrane. The floor of the antrum formed a loop just above the apex of the second bicuspid which continued to the sclerosed area. In addition to these complications, the root canal fillings of the neighboring teeth were incomplete.

After the extraction of the second bicuspid it was found that the root was septic but that the antrum was separated from it by the alveolar bone. The pain, however, did not subside and the patient continued to bleed through the nose. An opening was made into the maxillary antrum, using the Caldwell-Luc technic, and a hard submucous tumor was found just within the antrum. It was not attached to the bone.

Histopathological examination revealed irregular bone trabeculae scattered throughout the fibrous tissue which showed the typical appearance of an osteofibroma arising from the periosteum of the alveolar bone (Fig. 2).

CASE 2—A man, aged 37, had clinical symptoms that resembled those of Case 1. He

Fig. 1—Case 1. Second bicuspid; area of osteosclerosis can be seen above apex

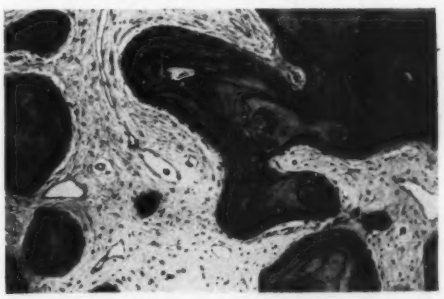


Fig. 2—Case 1. Irregular bone trabeculae scattered throughout fibrous tissue

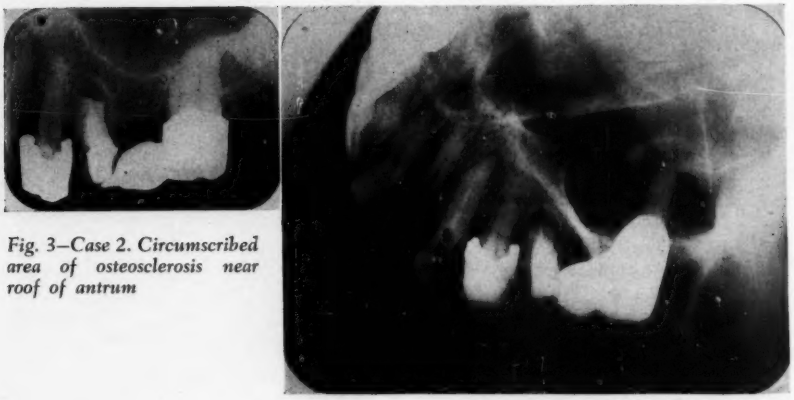


Fig. 3—Case 2. Circumscribed area of osteosclerosis near roof of antrum

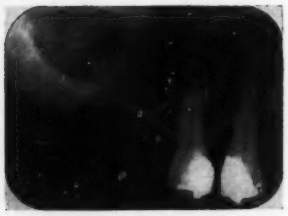


Fig. 4—Case 3. Circumscribed radiopaque area having appearance of cotton wool located in floor of maxillary antrum

complained of dull pain in the right side of the face, but it was not of dental origin. The face on the affected side had become swollen on several occasions, and there was simultaneous bleeding from the nose. Roentgenographic examination showed a circumscribed area of osteosclerosis in the antrum, near its roof (Fig. 3). A growth was removed, and it was found to be a submucous osteofibroma.

CASE 3—A woman, aged 37, had had the maxillary left first molar extracted eight months prior to our examination. The clinical signs resembled an oroantral fistula. No pain was experienced, but occasionally there was slight bleeding from the fistulous opening. Roentgenographic examination revealed a circumscribed round radiopaque area in the floor of the maxillary antrum which had the appearance of cotton wool (Fig. 4).

On opening the maxillary antrum through the partly healed molar socket, a hard tumor-like substance was found to be present between the antrum and the alveolar plate. The tumor which was the size of a cherry stone, extended deep into the antrum. It was removed and histological examination showed it to be an osteofibroma.—*6, Frognal Lane.*

Odontogenic fibroma: *report of case*

■ *Karl W. Bruce,* D.D.S., and Kenneth D. Devine,† M.D., Rochester, Minn.*

Fibromas of the jaws which are derived from the dental system are necessarily developed from the mesenchymal portion of the tooth germ. Thoma and Goldman[1] have suggested that these tumors originate from the embryonic tissue in the dental papilla, from the dental follicle, and later from the periodontal membrane. They may appear at the coronal or the apical portion of the tooth.

Thoma[2] has reported on an odontogenic fibroma which was associated with the root of a partially erupted mandibular third molar tooth, and Thoma and Goldman[1] have also presented the roentgenogram of another fibroma of odontogenic origin that appeared to circumscribe the crown of an unerupted mandibular third molar tooth. The last named authors stated that an odontogenic fibroma may represent a transitory stage toward the further development either of cementoma, if it occurs at the apical region, or dentinoma, if it should appear at the coronal aspect of an unerupted tooth. There is some question, however, as to whether a dentinoma develops as a pure tumor from an odontogenic fibroma which has originated from the follicle of an unerupted tooth. The majority of so-called dentinomas which are situated at the coronal aspect of an unerupted tooth and which have been reported probably are calcified mixed odontogenic tumors (complex composite odontomas).

The following case is an example of an odontogenic fibroma which developed in the follicle of an unerupted six year molar.

REPORT OF CASE—A five year old white girl had a moderately firm, red, ulcerated mass on the alveolus of the left side of the mandible posterior to the deciduous second molar tooth. The alveolus was moderately broadened in this region. The lesion was not particularly painful. It had been known to be present for six weeks prior to examination. The patient's local dentist had lanced the lesion one week previously with the hope of establishing drainage, but this effort was not successful.

The clinical impression was that the mass was larger and somewhat firmer than would be expected if it represented a permanent tooth about to erupt. The enlargement was not typical of an inflammatory lesion either. There was no evidence of cervical adenopathy. Dental roentgenographic examination revealed that the mandibular six year molar on the left side was partially erupted through the crest of the alveolar process. The roentgenogram, however, did not demonstrate the diffuse destruction of bone that is sometimes observed in association with a malignant lesion arising on the alveolar mucosa.

Biopsy disclosed that the growth consisted of vascular, chronic inflammatory fibrous tissue with ulceration of the epithelium. The patient was then placed under observation and was seen twice in a five week period. It was evident at the second visit, five weeks after biopsy, that the lesion had not improved; actually it appeared to be slightly enlarged (Fig. 1, A). Dental roentgenograms were again made of this region, but they did not reveal any pertinent change over what had been observed five weeks earlier (Fig. 1, B).

It was decided to perform another biopsy and at the same time to undertake suitable surgical measures depending on the report on

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†Section of plastic surgery and laryngology, Mayo Clinic.

1. Thoma, K. H., and Goldman, H. M. Odontogenic tumors: survey of 75 cases. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 32:763 Dec. 1946.

2. Thoma, K. H. Oral pathology, ed. 3. St. Louis, C. V. Mosby Co., 1950, p. 1298-1299.

Fig. 1—A: Tumor on left side of mandible measuring 3 cm. in diameter. B: Unerupted six year molar that has broken through alveolus in region of tumor. Soft tissue mass is evident lying superior to crown and continuous with cervix of tooth

the examination of fresh frozen sections. Microscopic examination disclosed that the tumor consisted of vascular, rather dense fibrous connective tissue with but few fibrocytes. Sparsely scattered throughout the fibrous connective tissue, however, were a very few epithelial islands and strands which were typical of the enamel epithelial debris seen occasionally within the fibrous connective tissue wall of the follicle of an unerupted tooth. It was evident, then, that the tumor had developed in the follicle of the underlying six year molar tooth. A histopathologic diagnosis of benign odontogenic fibroma was made (Fig. 2).

On further surgical exploration, the tumor was observed to lie on and around the associated six year molar tooth, thus creating a shallow bony cavity. The six year molar and the mobile second deciduous molar were extracted, and the tumor cavity was thoroughly curetted.

COMMENT—The clinical and roentgenographic investigations of a lesion such as the one under discussion are both valuable and important diagnostic aids, yet the microscopic

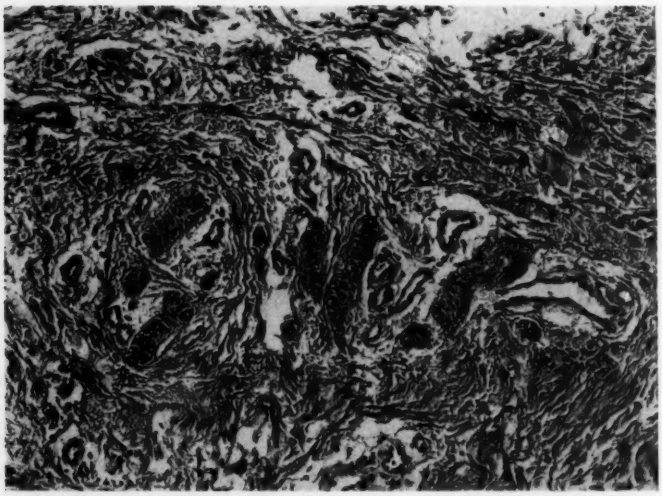

Fig. 2—Section of odontogenic fibroma showing vascular, moderately dense fibrous connective tissue with few fibrocytes (Hematoxylin and Eosin; magnification ×125)

study of the tumor tissue determines the final diagnosis. It is necessary to submit representative tissue in sufficient amount to the pathologist so that he may correctly identify a tumor when some of the salient diagnostic elements are not uniformly distributed throughout. In some instances it is necessary to repeat the biopsy, as was true in this case of odontogenic fibroma.

Histopathologically an odontogenic fibroma may consist of a solid mass of embryonal connective tissue which contains small spindle and stellate cells. Other odontogenic fibromas, however, may become more differentiated and exhibit a considerable amount of collagen with fewer spindle-shaped fibroblasts, as was typical of the present case.

It is a great help in making the diagnosis of fibroma of odontogenic origin if a few strands or rosettes of enamel organ epithelium are included in the section. The enamel epithelial debris is an unimportant biologic part of the tumor. It is impossible to determine from the few cases of odontogenic fibroma that have been reported whether enamel epithelial debris can be universally identified on close microscopic scrutiny.

Conklin[3] found isolated nests or cords of epithelial cells in 66 of 100 follicles of unerupted teeth examined microscopically. The enamel epithelial debris in odontogenic fibroma should be present in no greater amounts than that which is observed in the follicles of unerupted teeth. It should be remembered, however, that if enamel epithelial strands and nests are present in large amounts, and particularly if these epithelial components are undergoing hyperplasia and attempting to form rudimentary enamel organs, a diagnosis of adamantinofibroma or adamantinoma should be entertained.

3. Conklin, W. W. Study of odontogenic epithelium in the dental follicle. Thesis, Graduate School, University of Minnesota, 1948.

■ The Benefits of Words

Words, like deeds, may be constructive or destructive, elements of strength or expressions of decay. Those who learn to speak with charm, precision, vigor, and good diction, soon experience the benefits of well-used words. *William G. Niederland, Man-Made Plague: A Primer on Neurosis.*

Hospitalization insurance for oral surgery

MOST HOSPITALIZATION INSURANCE CONTRACTS do not provide adequate coverage for oral surgery patients. Although it is true that many policies provide hospitalization benefits for major procedures, in many instances they do so only when the operating surgeon is a licensed doctor of medicine. On most occasions, they fail to provide coverage for patients requiring dental extractions unless the patient is hospitalized by a physician for treatment of some major physical illness and the dental extractions are done as a coincidental procedure during the admission. This is a matter of utmost importance and should receive early consideration by local and national oral surgery societies as well as by the American Dental Association. A concerted effort should be made to correct both of these deficiencies.

The limiting of benefits to those patients who have been admitted and operated on by a physician provides a loophole that allows an insurance company to escape what amounts to a moral obligation to its policy holder. Occasionally, after voluminous correspondence and reconsideration, a company may elect to make an exception to their written policy and allow payment of a claim when the surgery is done by an oral surgeon with a single dental degree. Although this solves the problem for an individual patient, it still allows the continuation of a discriminatory and unfair limiting clause in the policy. The company, therefore, may cease making exceptions to its adopted policy at any time it so desires. This in itself is of great potential importance, for sudden enforcement of the limiting clause by all companies in the hospitalization insurance field would curtail immediately the professional efforts of most oral surgeons insofar as their hospital work is concerned. The financial and professional repercussions of such a development are apparent. To deny patients expert oral surgical care because of such a discriminatory action is morally wrong and must be avoided.

Insurance companies can no longer afford to omit this important aspect of hospitalization. It is not likely, however, that they will liberalize their contracts in this regard with-

out stimulation from outside sources. It would seem, therefore, to be a timely moment for formation of an active hospitalization insurance committee, officially sponsored by the American Dental Association and dedicated to the purpose of developing a program to correct the present inadequacies. Its work should include early negotiation with the major hospitalization insurance companies in an attempt to amend the present contracts to allow benefits for all oral surgery procedures, either major or minor in nature, when performed by a qualified oral surgeon regardless of whether he has a medical degree, a dental degree, or both.—*Fred A. Henny.*

■ Artificial respiration is occasionally required for dental patients. It may be given with the patient in the chair or in a prone position on the floor.

With the patient in the dental chair, manual artificial respiration may be done effectively by the following method:

1. Lower the back of the chair so that the patient is placed in a horizontal position. The entire chair should be as close to the floor as it will go with the patient horizontal. Precautions should be taken to keep the patient from sliding out of the chair.
2. Stand behind the chair, facing the outstretched body.
3. Fold the patient's arms across his chest so that his wrists rest side by side.
4. With both hands grasp the patient's wrists. Raise his arms upward over his head, keeping the wrists together. Lower the arms to the chest and press down firmly. Once again raise the arms over the head and lower them to the chest, thus completing the cycle. Cycles should be done at a rate of 16 a minute. It is important to prevent the tongue from falling backward and obstructing the airway.

If time permits, the following method should be used as it has the advantage of having the patient face down and thus keeps the tongue free for a clear airway.

1. Place the patient in the prone position on a firm, non-yielding surface such as the floor or ground.
2. Place the patient's hands, palms downward, so that one hand overlaps the other. Then place the hands under the patient's face which is turned to one side. The neck should be slightly extended, and the tongue must not cause any obstruction.
3. Kneel at the patient's head, facing the outstretched body.
4. Grasp the patient's elbows and elevate them firmly and gently upward and forward.
5. Lower the elbows to the floor and release them. Apply the palms of your hands to the patient's scapulae and press downward on the back of the patient. Release pressure. Grasp the elbows to repeat the first movement.
6. The elbow elevation and downward pressure on the back should be done to a rhythm of approximately 16 a minute.

■ The increasing number of anaphylactic reactions to penicillin, several of them resulting in death, emphasizes the importance of rapid access to emergency medication. Immediate subcutaneous injection of 1.5 cc. of epinephrine (1:1000) may be lifesaving. The ready accessibility of the epinephrine is of prime importance. A syringe, previously filled, should be available in the same room in which the penicillin injection is given. Most patients who experience severe reactions to penicillin usually have become sensitized through previous use of the drug. In many instances so far recorded, the patients have been asthmatic and have had penicillin previously. The taking of a careful history to discover any possible previous reaction to penicillin is of utmost importance. If the patient has not had penicillin previously, he usually is considered a safe risk. However, epinephrine should be available immediately on every occasion.

Readers are invited to send their clinical observations to the editor, Fred A. Henny, Henry Ford Hospital, Detroit.

■ Appliances for Jaw Function

Q.—Will you please comment on the use of appliances to maintain function after resection of the mandible?

A.—A number of appliances have been devised and successfully used for this purpose. These include custom-made metallic splints of Vitallium or stainless steel for replacement of resected parts of the mandible. In certain types of short-span partial resection, standard Sherman-type stainless steel plates may be used. Acrylic appliances also have been fashioned to maintain jaw function after resection. The appliance should be inserted at the time of resection in order to minimize deformity and loss of function. Malposition of the remaining fragments will make future graft and other reconstruction procedures increasingly difficult. The advantages of support for the tongue and floor of the mouth in the immediate postoperative phase are appreciable. The use of such appliances deserves adequate consideration in the preoperative period.

■ Infraorbital Injection for Nerve Block

Q.—I have not found the infraorbital injection satisfactory in attempting a block of the anterior alveolar nerves. Would you give me some help on technic?

A.—The anterior superior alveolar nerves do not reach the infraorbital nerve at the foramen, but rather at a distance of 5 mm. more or less from the opening on the norma frontalis. To block these anterior superior alveolar nerves a high diffusion anesthetic such as lidocaine hydrochloride may be deposited subperiosteally or superperiosteally in the canine fossa. At this point the nerves are in or on the anterior wall of the maxillary sinus. One should bear in mind the possible enervation of the incisors by the nasal palatine nerve and should be prepared to block it intranasally in the event painful stimuli persist after blocking of the anterior superior alveolar nerves.

■ Administration of Bilateral Inferior Alveolar Nerve Block

Q.—What are the dangers of administering a bilateral inferior alveolar nerve block?

A.—There are no significant contraindications to the giving of bilateral inferior alveolar blocks with local anesthesia. There may be an increased hazard of accidental biting of the lip during anesthesia, but there is no appreciable motor loss in control of the tongue or jaws.

■ Teeth Fused to a Cementoma

Q.—Can lower incisor teeth which have their apexes fused to a small cementoma be removed in a way which will conserve the alveolar process?

A.—Yes. The roots will fracture at the fusion with the cementoma. The apexes and cementoma may then be removed through a window at the periapical level, thus preserving the ridge crest and bridge of the labial plate.

This section, devoted to queries and comments from readers on topics of current interest to oral surgeons and general dental practitioners, is edited by James R. Hayward, University Hospital, Ann Arbor, to whom readers are invited to send their communications. The answers, prepared by competent consultants, do not necessarily represent the opinions of any official scientific organization. Your participation in this section is invited.

The Editor

■ Treatment of Cyst Causing Tooth Divergence

Q.—Divergence of the mandibular central incisors was seen in a boy aged 12. Roentgenographic examination revealed a discretely outlined radiolucent area in the midline. The teeth are vital and noncarious. Have you suggestions for treatment?

A.—From your description this would be a developmental fault, a cleft persistence at the symphysis where the two mandibular processes met during embryonic life. In the treatment of a cyst, Partsch procedure may be indicated, a procedure in which the cyst is unroofed and a filling is placed in the defect until danger of injury to contiguous structures has passed. A second method would be that of enucleation of the cyst through a mucoperiosteal flap. In any event, a micropathological examination and diagnosis of the contents of the lesion are certainly in order.

■ Antibiotics for Patient Allergic to Penicillin

Q.—If a patient has an acute dental infection and is allergic to penicillin and chlortetracycline, what other antibiotic would you suggest I use?

A.—Broad spectrum antibiotics which could be used are erythromycin, tetracycline (Achromycin) and oxytetracycline (Terramycin). If the patient does not show a favorable clinical response after 48 hours on one of these drugs, with the usual drop in fever and reduction in other inflammatory signs, another antibiotic may be selected. Wherever it is possible to localize infectious processes by heat and hydrotherapy, it is preferable to incise and drain the lesion in order to obtain a culture so that a more rational selection of the antibiotic can be made. From these cultures it is possible to identify the organism and, through laboratory means, to determine the sensitivity of the organism to specific antibiotics.

In rare instances, a troublesome and persistent infection will be found where the antibiotic which must be used will produce an allergic response. When there is no other antibiotic which is equally effective, it is possible to administer the antibiotic with correlated use of antihistamine drugs in order to control the allergic responses of the patient. Most allergic reactions are confined to urticaria and other dermatologic reactions. The extreme forms of allergic response to antibiotics have been treated effectively on an emergency basis with cortisone.

■ Removal of Malposed Teeth

Q.—Should all permanent teeth which are malposed around a congenital cleft through the alveolar ridge be removed when a child has reached eight to ten years of age?

A.—No. The functional potential of some of these teeth is important, and their presence may stimulate growth of the alveolar process. Competent orthodontic consultations in such matters are of paramount importance.

■ Antibiotics in Heart Disease

Q.—What types of heart disease require the precaution of antibiotic premedication before extractions?

A.—The purpose of antibiotic administration is to avoid subacute bacterial endocarditis. The diseases which produce damaged heart valves and lining predispose the patient to this hazard during phases of transient bacteremia. These diseases include rheumatic fever, which causes heart damage, and congenital heart disease, which results in an altered heart structure.

■ THE ROENTGENOLOGIST IN COURT. By Samuel Wright Donaldson, M.D. Second edition. 348 pages. Index. Price $7.75. Springfield, Ill., Charles C Thomas, 1954.

Dr. Donaldson has approached his subject with a physician's viewpoint and has made interesting reading, for the most part, of material that could be difficult to understand. He covers the subject of medical law thoroughly, from malpractice through criminal law, as it applies to medicine and dentistry.

The book applies most directly to the roentgenologist, but, as the author points out, "The courts have stated with emphasis that radiography must be used routinely in order to practice dentistry with ordinary care, skill and diligence." From this standpoint, then, there is value in the book for all who practice dentistry.

Where states have made different interpretations of cases, the decisions are classified and states are listed as having interpreted them one way or the other, so one can understand how the law has been interpreted in each state.

Because of the chapter relating to dentistry this edition would be of help in preparing the dentist to take the stand if and when necessary.—*Henry Cline Fixott, Jr.*

■ THE PHYSICIAN IN ATOMIC DEFENSE. By Thad P. Sears, M.D. 308 pages with 53 illustrations. Index. Price $6. Chicago, The Year Book Publishers, 1953.

This book is written for the purpose of instructing the physician in the nature of atomic energy and the effects it may produce on the body. The author has condensed a vast amount of information concerning the various forms of radiation and atomic energy, in both war and peace.

He points out that in caring for victims of an atomic bomb attack dentists will be greatly needed, and should have some preliminary training in first aid and emergency medical casualty care.

A discussion of atomic structure and the influence of radioactivity is followed by a description of isotopes, their methods of manufacture and their application to medical practice.

The author then outlines the nature of atomic bomb injuries and various types of protective therapy.

Final chapters cover methods of mass casualty care. As the number of physicians and nurses will be too few to care for the thousands of casualties following an atomic attack, the author points out that there will be need for auxiliary medical workers. These workers, he says, should be trained now.—*Russell W. Bunting.*

■ ORAL CANCER. By J. Roy Bourgoyne, B.S., D.D.S. 295 pages. Price $6.50. Philadelphia, Lea & Febiger, 1954.

What Dr. Bourgoyne has presented to the profession is a digest, in palatable form, of the current knowledge of cancer in general and oral cancer in particular. The book, however, will not enable dentists, oral surgeons or physicians "to recognize, diagnose and treat cancer of the mouth and surrounding areas" as has been claimed unless they have had previous clinical experience in the field. The material is presented in too brief a form to accomplish so broad an aim.

Dr. Bourgoyne has culled the scientific literature and drawn from his professional experience much that is worth presenting. He begins with a chapter on the etiology of cancer and presents those theories which have affected the thinking of researchers to date. There is a chapter on diagnosis and treatment planning which is general and not devoted exclusively to the problem of oral cancer. There are chapters on the nomenclature and classification of neoplasms with particular emphasis on those

most frequently encountered in or near the oral cavity. Methods of cancer detection are discussed with a separate chapter on the technic of taking a biopsy specimen.

The treatment of cancer is handled without much mention of oral cancer. There is, however, an excellent chapter entitled "Radiation Therapy in the Treatment of Cancer" by Dr. David Carroll which is extremely informative and which is so well written that one cannot help but grasp the fundamentals involved in this form of treatment. Included also is a chapter on maxillofacial prosthetics, a question and answer review chapter and an excellent glossary.

Oral Cancer is an excellent review for those with considerable experience in the field. It could serve also as a starting point for those who wish to become better acquainted with this important problem.—*Marvin Revzin.*

■ PLASTIC SURGERY AT THE NEW YORK HOSPITAL 100 YEARS AGO. By Herbert Conway, M.D., and Richard B. Stark, M.D. 110 pages with illustrations and bibliography. Price $5. New York, Paul B. Hoeber, Inc., 1953.

This is the story of the development of plastic surgery in the middle of the nineteenth century with a brief biographical sketch of Gurdon Buck, a surgeon of that period. Dr. Buck is best known for "Buck's extension," a procedure which used traction in the treatment of fractures of the femur. His book *Contributions to Reparative Surgery* published in 1876 established him as a pioneer in reconstructive surgery.

The treatise contains several detailed descriptions by Dr. Buck of various operative technics for plastic reconstruction of the face. One case report deals with the repair of maxillofacial tissue extensively destroyed by gangrene. Dr. Buck generously acknowledges his reliance on "Mr. Thomas B. Gunning, a skillful dentist" for the construction of an ingenious appliance for the patient. This preoperative prosthesis was indispensable to the treatment plan, and Dr. Buck describes its design and function in highly complimentary terms.

Dr. Buck outlined principles for the use of relaxation incisions, pedicle flaps and the rotation and advancement of soft tissue flaps. He advocated the use of multiple, fine sutures and practiced their early removal. His approach to the problems of plastic repair may be considered fundamental to modern concepts of treatment.

This book will make enjoyable reading for those interested in the historical background of surgery in the Civil War era. Despite the limitations of knowledge and experience of those days, the results achieved deserve our admiration and respect.—*James Springer.*

■ DIE HALS, -NASEN, -OHRENHEILUNDE FUR STUDIERENDE DER ZAHNHEILKUNDE UND ZAHNÄRZTE. By Helmut Loebell, Prof. Dr. med. Fourth edition. 90 pages with 25 illustrations. Index. 7.50 DM. Leipzig, Germany, Johann Ambrosius Barth, 1954.

This book, designed for dental students and dentists, is a compendium of diseases of the throat, nose and ear. The clinical considerations and pathology of each organ are preceded by a description of its anatomy and physiology.

The book may be helpful in giving the student or practitioner a quick orientation in the subject. However, the special and extensive literature must be consulted for an adequate understanding of the pathological conditions which occur in the mouth or jaws and which reach the neighboring organs.—*Eugene Schorr.*

■ DIE ERKRANKUNGEN DER SPEICHELDRÜSEN. By Hermann Mathis, Prof. Dr. med. 90 pages with 58 illustrations. Index. Price 92 DM. Muenchen, Germany, Carl Hanser, 1954.

This monograph deals with the diseases of the salivary glands. The author starts with an evaluation of sialography and supports his fine description with clear illustrations.

One chapter is devoted to the physiological and pathological activity of the glands. The author describes the pathology of these organs and includes a discussion of clinical cases. One

reads with interest the theory, clinical considerations and therapy associated with these pathological conditions.

The book is well written and covers the international literature. It is a fine addition to the literature of the diseased salivary glands. —*Eugene Schorr.*

■ STEDMAN'S MEDICAL DICTIONARY. Edited by Norman Burke Taylor, M.D., in collaboration with Lieut. Col. Allen Ellsworth Taylor, M.A. Eighteenth edition. 1,561 pages with 622 illustrations. Appendix. Price $11.50. Baltimore, Williams & Wilkins Co., 1953.

The eighteenth edition of this well-known medical dictionary has an enlarged format and an increase of 200 pages over the preceding edition. Much of the increase is accounted for by the addition of hundreds of new definitions relating to recent developments in the medical sciences. Some obsolete terms have been deleted, and many definitions have been revised or expanded. Meaning, pronunciation, and derivation are given for every word. Terms used in dentistry, chemistry, veterinary medicine and other health sciences are included.

Various added or improved features facilitate the use of this edition. Several hundred new text figures, most of them original drawings, illustrate definitions. Anatomical tables listing arteries, muscles and nerves appear in their alphabetical place through the dictionary. Entries for anatomical terms have been translated from the former Latin forms and are now presented in their English equivalents in the tables. The history of medicine is not neglected. Brief biographical sketches of leading figures in medical history are provided.

One of the most interesting sections of the dictionary is a valuable article on medical etymology which contains a detailed root-word list. Comments are included on the careless formation of hybrid words which combine elements from different languages. Those who are discriminating in language will enjoy the article; others need it.

Despite the interest of the editors in word formation, dental specialties appear to be listed entirely with the less exact suffix *ia*—orthodontia —rather than the more accurate and currently approved ending *ics*—orthodontics. Perhaps an authority on dental nomenclature should be considered for inclusion in the work on future editions.

On the whole this edition continues the scholarly character and high standard long associated with *Stedman's Medical Dictionary.*— *Ida Marian Robinson.*

■ HEALTH MANPOWER SOURCE BOOK. Section 2, Nursing Personnel. By H. G. Tibbets and E. Levine. 88 pages. 56 tables. Index and appendix. Price 40 cents. Washington, D. C., U. S. Government Printing Office, 1953.

This pamphlet is a compilation of data on the number, distribution, and characteristics of nursing personnel in the United States. Frequent requests from individuals and organizations for this information prompted the Public Health Service to compile it.

The material in this source book includes data on practical nurses and nurses' aids, as well as registered nurses.

A careful look at the table of contents and the 56 tables will show how detailed and systematic are the data regarding nursing "manpower" in this country.—*F. C. Cady.*

■ FREE SKIN GRAFTING WITHIN THE MOUTH. Frederick A. Figi and James K. Masson. Plast. & Reconstruct. Surg. 12:176 Sept. 1953.

During recent years intraoral skin grafts have been used with increasing frequency and for an ever wider variety of purposes. Their application for correction or repair in cases of traumatic deformities of the mouth, infections and operations causing loss of oral mucosa, scar contractures and fixation within the mouth, extrinsic ankylosis of the mandible and impaired function of the intraoral structures has shown the value of this procedure.

The use of free intraoral skin grafts is indicated wherever sufficient loss of mucous membrane and soft tissue has occurred to produce considerable functional impairment or severe deformity. The region from which the skin graft is to be taken should be as free from hair as possible. The graft usually can be cut sufficiently thin to avoid difficulty on this account, but it must be borne in mind that the tendency to shrink increases with the thinness and that on the other hand excessively thick grafts do not "take" well.

The graft can be held in place with greased iodoform gauze, a sponge rubber mold or dental compound. Immobilization of the stent supporting the graft is supplied by an appliance that can be attached to the teeth, or fixation is secured by passing silk mattress sutures through the cheek, lips, submental or submaxillary region and tying the ends securely over a large gauze pad on the cutaneous surface after engaging the graft-covered stent in the loop of these sutures inside the mouth.

Hemostasis is even more important in intraoral skin grafting than in grafting of the cutaneous surface because of the possible contamination of the field. In regions difficult of access, electrocoagulation of bleeding points is highly effective.

Preferably nothing is given by mouth for several days postoperatively; nourishment and fluids are administered through a nasal feeding tube or intravenously. Antibiotics are used for the first five or six days as a prophylactic measure. Generally, the stent is left undisturbed for about ten days. Prompt replacement of the stent with an acrylic prosthesis is essential. A duplicate of the stent must be worn while the acrylic prosthesis is being processed, and on withdrawal of the former the latter must be inserted immediately. A delay in this replacement may permit enough shrinkage of the graft to render insertion of the prosthesis impossible. Depending on the thickness of the graft, the prosthesis must be worn continuously for at least several months except when it is removed briefly for cleansing. With attention given to these details, intraoral skin grafts yield highly satisfactory results.—*C. Dean Couch, Jr.*

■ HEALING IN MAXILLOFACIAL STRUCTURES. Stephen Hudack and Donald M. Glover. Am. J. Surg. 87:646 May 1954.

Healing of the tissues in the maxillofacial region fulfills the same cycle as occurs elsewhere in the body. Yet in spite of this, the healing in the regions of the face, head and neck differs from that in the body as a whole in a number of ways. Because the venous tributaries lie above the atrial level, venous drainage is aided by gravity. Drainage of the lymphatic capillaries also is aided by gravity. Because they are invisible, delicate and subserve special functions not usually thought of, the lymphatic capillaries of the skin often are ignored; yet they form the second line of defense against infection. They are of importance in the development of edema and in laceration and trauma, the resolution of edema depends on the lymphatics in a way second in importance only to the vascular supply itself. The lymphatic capillaries are especially important in the intracutaneous edema of cellulitis or lymphatic stasis.

In the use of grafts the prime consideration, of course, is the vascularity of the host site. The chances of success in a graft, therefore,

are greater where fibrous impairment of circulation, either as result of irradiation or infection, is not an impeding factor. Grafts for the jaw or other facial areas are better when drawn from other membrane bones rather than from cortical bone. Rib grafts or iliac grafts appear to revascularize better. Multiple cancellous grafts are revascularized more quickly than solid grafts, but solid grafts, effectively fixed, can bridge a gap and restore function. Restoration to function, in turn, speeds up creeping replacement so that the graft is used up during its replacement.

From studies in heterotopic bone and in the healing matrix of both soft tissue and bone, it appears that grafts are ultimately replaced. Physiologically, there is no reason why the mandible cannot be entirely replaced by an inert substitute. If this substitute is thought of as replacing the inert skeletal and supportive elements of a graft, it can be seen that the replacement should be cellular or porous, the cellular structure providing interstices into which the host tissue eventually grows. This substitution has been used already, in a sense, in replacement of fascial defects. In these cases it has been found that the interstices must be at least as large as 100 mesh screen. It is desirable that a graft substitute for bone be developed which has no tissue specificity and will be accepted temporarily by the host and eventually replaced. —*Myron Kaufman.*

■ TREATMENT OF TUMORS OF THE PAROTID SALIVARY GLAND. Irving M. Ariel, Anthony P. Jerome and George T. Pack. Surgery 35:124 Jan. 1954.

The inadequacy of past methods of treating parotid tumors has produced a high rate of recurrences and failures, which has caused confusion concerning the natural history of parotid neoplasms. It has been determined that most tumors arise as a single nidus and gradually grow to infiltrate the glandular parenchyma and sometimes to compress or infiltrate the facial nerve. The high recurrence rate results from inadequate removal, which is caused by fear of damaging the nerve. It is desirable, therefore, to have criteria for treating parotid neoplasms and to follow surgical technics which will permit their resection without damaging the facial nerve unless the nerve has been invaded by cancer and must be sacrificed.

The clinical features of 100 patients with tumors of the parotid salivary gland were studied. Parotid tumors comprised 0.5 per cent of all the neoplasms treated at the Pack Medical Group. Of the 100 patients, 54 had benign tumors, and 46 suffered from carcinoma. The average age of all patients was 45.2 years. Although the average age of patients with benign tumors (36.1 years) was less than that of patients with carcinoma (52.9 years), there was so much overlapping in the ages of the two groups that the age of a given patient could not be utilized as a diagnostic criterion. The symptom most frequently observed in the first examination was the presence of an asymptomatic mass in the vicinity of either ear.

The diagnosis of benign or malignant tumor cannot be made clinically, except in advanced cases, and a biopsy must be taken to determine the type and extent of the surgical intervention required. It is considered unwise to perform an incisional biopsy before operative intervention for fear of rupturing the capsule and inducing exophytic extension. Therefore, an exploratory incision into the parotid gland is made, and a frozen section is performed. If this test is not diagnostic and the resection would involve sacrifice of the nerve, it is believed that the patient is best benefited if the operator closes the wound and awaits the diagnosis from paraffin sections before proceeding with the radical operation.

Technics for surgical extirpation of parotid neoplasms have been developed on the basis of the surgical anatomy of the parotid salivary gland, the anatomy of the facial nerve, the lymphatic drainage of the parotid salivary gland, and the natural history of neoplasms arising from this organ. Irradiation has an important role in the treatment of parotid neoplasms, but radiation therapy should not be used as a crutch for inadequate surgical removal but only when there are specific indications for its use. A study of the data aids in establishing the cause for frequent recurrences in the past.

There was no correlation between recurrence and the age of the patient, delay before therapy was instituted, the size of the tumor, or any feature of its histologic picture. The bulk of the evidence indicates that a recurrence is the result of inadequate extirpation.

Of the 54 patients with mixed parotid tumors, 31 per cent suffered recurrences. Of the 34 patients treated initially at the institution of the Group, only 1 suffered a recurrent tumor. Of the 46 patients with carcinoma, 37 per cent suffered a recurrence an average of 2.7 years from the time treatment was attempted.

The absolute five-year survival rate for patients with benign tumors is 83.3 per cent and for patients with carcinoma 32.2 per cent. The relative five-year survival rate for patients with benign tumors is 96.2 per cent and for patients with malignant neoplasms 41.7 per cent. The therapeutic five-year survival rate for patients with parotid cancer is 83.3 per cent.—*Myron Kaufman.*

■ LEONTIASIS OSSEA. John Evans. J. Bone & Joint Surg. 35-B:229 May 1953.

Leontiasis ossea is defined as a generalized homogeneous swelling of the facial bones occurring usually in the first decade of life. The swelling may spread to the lower jaw and the cranium. The clinical picture shows an insidious onset of facial deformity with or without proptosis, nasal obstruction and impairment of vision. Pathologically and roentgenographically, two main types may be recognized: in one there is sclerosis of the bones, associated mainly with infection; in the other there is an osteolytic process which as a rule is not associated with infection.

Leontiasis ossea may be classified as follows:

True leontiasis ossea

Type 1. Virchow's type or sclerotic type

Type 2. Fibrodysplastic type which includes: monostotic fibrous dysplasia, polyostotic fibrous dysplasia, Albright's syndrome, multilocular cystic disease of the jaws.

False (symptomatic) leontiasis ossea—Paget's disease, congenital gigantism, pituitary gigantism, craniostenosis, benign and malignant tumors of the nose and air sinuses, syphilitic osteoperiostitis.

The prognosis in lenotiasis ossea now is better than it was previously. In a third of the patients facial disfigurement is the only symptom. Visual lesions are serious but occur in only 20 per cent of the cases. The occasional unfavorable prognosis has been made for associated diseases wrongly identified as leontiasis.

In view of the favorable prognosis, prophylactice removal of the mass is unjustified. The treatment is mainly symptomatic. The most important part of the treatment is to relieve the eye symptoms by decompression of the optic nerve. Neuralgia of the fifth nerve accompanied by headache may indicate an operation. Probably the most common surgical treatment in the proved Type 2 case is to restore a normal facial contour by plastic operations.

Roentgenotherapy may be used alone or in conjunction with surgery. It has been proved to have a beneficial effect in all cases, effecting a reduction both in the size of the bone tumor and in the symptoms. The dosage recommended is 2,000 to 3,000 r.—*C. Dean Couch, Jr.*

■ ADVANTAGES AND COMPLICATIONS OF TRACHEOTOMY. H. S. Davis, H. E. Kretchmer and R. Bryce-Smith. J.A.M.A. 153:1156 Nov. 28, 1953.

During the last ten years tracheotomy has been performed more frequently, but is still usually an emergency procedure; the newer concept of an elective operation has been accepted with reluctance in many quarters. Anesthesiologists have come to recommend this operation more as a prophylactic measure than as an emergency treatment not only because an airway is assured but perhaps even more because it provides an easy route to the lower respiratory tract for aspiration of secretions.

Recently, however, the value of tracheoto-

my has become apparent in the following conditions: (1) weakness of the respiratory muscles with difficulty in removal of secretions by coughing, (2) loss of voluntary control of the airway, and (3) unconsciousness with an absent or weak cough reflex leading to subsequent atelectasis and pneumonia. Its use is advocated also in various other conditions, including certain diseases of the central nervous system, barbiturate intoxication, acute laryngotracheobronchitis, trauma and neoplasms affecting the upper respiratory passages.

The fear of disfiguring cosmetic results is uppermost in the minds of many persons. Paradoxically, this objection is rarely listed in the medical literature, perhaps because those who raise the objection realize that a scar is a small price to pay for averting certain death. Other complications, both immediate and postoperative, must be considered as calculated risks.

Severe hemorrhage, technical difficulty with the surgical procedures, pneumothorax, mediastinal emphysema, laceration of the esophagus, massive aspiration of blood, prolonged apnea in the relief of obstruction, and even death have been reported as immediate operative complications. In addition, the following factors must be listed as possible complications: secondary hemorrhage, tracheobronchitis, atelectasis, pneumonia, subcutaneous emphysema, obstruction of the tracheal cannula, incorrect size of the cannula, glottic stenosis, infection of the wound, hoarseness, and difficulty in extubation.

In view of the formidable list of complications and the hesitancy of some surgeons to perform elective tracheotomy, it was decided to study the direct complications and effects of the operation before further encouraging its use. In all, 155 tracheotomies were included in the study. Although 155 related complications were encountered, all of these occurred in only 54 tracheotomies. In 20 of the 54 tracheotomies, there were major complications, 14 of which were emergencies.

Elective tracheotomy reduces the number of serious complications and is to be preferred to an emergency operation whenever possible. The high incidence of complications must be considered in relation to the gravity of the patient's condition, with asphyxia and probably death as an alternative. The cosmetic results were satisfactory in 84 per cent of these cases; therefore, cosmetic considerations should never influence the decision to perform the operation. Tracheotomies should be recommended whenever the patient's ability to maintain an airway or to remove secretions is seriously impaired.—*Myron Kaufman.*

■ Mode of Action and Effects on Tissues of Long-Acting Local Anesthetics. Walter Mannheimer, Philip Pizzolato and John Adriani. J.A.M.A. 154:29 Jan. 1954.

The search for satisfactory long-lasting local anesthetics in nerve blocking continues. A recently introduced and apparently prematurely acclaimed preparation known as Efocaine has aroused interest. Efocaine contains procaine base (1 per cent), butyl-p-aminobenzoate (Butesin) (5 per cent), and procaine hydrochloride (0.25 per cent), in a mixture of polyethylene glycol (2 per cent), propylene glycol (78 per cent) and water (20 per cent).

Contact with an aqueous medium causes the procaine base and the butyl-p-aminobenzoate to precipitate. Presumably the drugs are slowly absorbed when they are injected perineurally, and a long-lasting anesthetic effect is obtained. The possibility of the deposition of crystalline substances in the tissues on contact with water and the resultant production of a foreign body reaction have not been emphasized. Some users have reported success with this preparation.

In the experience of the authors, the long-lasting effect was not always obtained; pain and soreness at the site of the injection were the rule rather than the exception. Symptoms of local inflammatory reactions and neuritis were frequent after its use. Preliminary reports state that Efocaine causes no local damage to tissues. The intense pain experienced after the injection raises the question as to whether or not this observation is correct.

It was felt that further investigation of the local effects of this preparation was neces-

sary and that a comparison of the effects with those caused by other currently available substances for long-lasting anesthesia would be desirable. Some of the currently employed preparations for long-lasting anesthesia are oily solutions of local anesthetic drugs. Many contain phenol or benzyl alcohol in addition to the local anesthetic drug.

The effects of various currently used long-lasting anesthetic substances injected intraneurally and perineurally on nerve and muscle tissue were studied histologically in experimental animals. Comparisons were made with results of injections of isotonic sodium chloride solution in controls. The saline solution caused no damage to either muscle or nerve tissue. Two per cent lidocaine hydrochloride (Xylocaine), 2 per cent procaine hydrochloride, Dolamine (a mixture of ammonium sulfate, 0.75 per cent; benzyl alcohol, 0.75 per cent, and aqueous ammonium sulfate) caused no damage after intramuscular injection and only transient changes after intraneural injection.

Efocaine, the vehicle used to prepare Efocaine, 5 per cent butyl-p-aminobenzoate dissolved in the vehicle, polyethylene glycol (molecular weight 300), absolute ethyl alcohol, and 6 per cent phenol destroyed both muscle and nerve tissues. After combined perineural and intraneural injection, the changes were identical to those occurring after a nerve was sectioned; but they occurred more rapidly. Regeneration of the nerves began at variable times but usually 60 days after the use of all drugs studied except ethyl alcohol. Alcohol, phenol, Efocaine and the vehicle in Efocaine caused anesthesia by nerve destruction rather than by blockade through their anesthetic effects.—*Myron Kaufman.*

■ SURGERY IN SKIN CANCER. John J. Wolfe. Am. J. Surg. 87:663 May 1954.

Cancer of the skin, so readily accessible for diagnosis and treatment, should become a major surgical problem only rarely. Radical excision and repair of primary lesions to prevent recurrent disease is a relatively simple procedure. The diagnosis of skin cancer also should present little difficulty.

It is not always possible to differentiate clinically between basal cell and squamous carcinoma. There are certain well-known characteristics, however. The basal cell lesion is typically slow-growing. It may arise spontaneously as a small superficial red spot which slowly ulcerates or becomes umbilicated. Usually the ulceration and induration are superficial; a pearly, rolled appearance of the edge is characteristic.

Frequently a history of trauma is related to the onset. Early squamous carcinoma may be suspected when there is rapidity of growth, a bulkier tumor, no tendency to early ulceration and umbilication. At this stage surgical excision, regardless of location, can be accomplished and repair made either by an undermining of the surrounding tissues, local flap or free graft method. Careful sectioning of the margins of the specimen will affirm or deny the adequacy of the excision. If the margins are not clear, reexcision should be carried out promptly; again the tissues must be checked histologically.

Conversion from basal cell to squamous cell carcinoma occurs frequently in recurrent disease whether the carcinoma is treated by irradiation or surgery. Many lesions diagnosed by original biopsy as basal cell carcinoma will on recurrence be reported as squamous cell carcinoma. Regardless of the method used to treat the initial lesion, the recurrent tumor appears to possess enhanced growth properties. This is particularly true of tumors unsuccessfully irradiated.

Another factor affecting the management of these tumors is the effect of irradiation on the tumor bed. Any tumor-resisting factors inherent in normal tissues seem no longer to be possessed by tissues subjected to heavy irradiation. Whatever these factors may be, certainly the clinical management thereafter is fraught with difficulties and disappointments. It is these cases of recurrence after irradiation that produce the greatest mutilation and mortality.—*Myron Kaufman.*

Announcements

■ American Society of Oral Surgeons Announces New Officers

The American Society of Oral Surgeons, which met November 3-6 in Hollywood, Fla., announces the following officers for 1955: C. Stanley Rice of Beverly Hills, Calif., president; Harry M. Seldin of New York, president-elect; G. Thaddeus Gregory of Indianapolis, vice-president; Frank B. Hower of Louisville, Ky., secretary-treasurer; Miss Ruth F. Whalen of Richmond, Va., executive secretary, and Frederick F. Pfeiffer of New York, new executive council member. The society will meet October 12-15, 1955, in Los Angeles.

■ European Dental Groups, Mexican Study Club Announce Meetings

Among meetings taking place in Europe during the year which are of interest to dentists are the July 4-8 meeting of the British Dental Association in Glasgow, Scotland; the July 11-14 meeting of the American Dental Society of Europe in Amsterdam, Holland, and the Second Panhellenic Congress and Council meeting September 25-30 in Athens, Greece. Information on the British meeting may be obtained from the secretary of the British Dental Association, 13 Hill St., Berkeley Square, London W. 1; on the meeting of the American Dental Society of Europe from J. Moloney, 110 Harley St., London W. 1, and on the Panhellenic Congress from B. Stefanopoulos-Vrettos, 71 Skoufa St., Athens.

In Mexico, the Grupo de Estudios Dentales del Universidad del Sur de California has scheduled its eighth annual seminar. The meeting will be held May 15-19 in Tehuacan, Puebla, Mexico.

■ Copenhagen to Be Host to Fédération Dentaire Internationale

Copenhagen, Denmark, will play host to the meeting of the Fédération Dentaire Internationale scheduled for August 14-20. Information on the meeting may be obtained from G. H. Leatherman, F.D.I. secretary, 35 Devonshire Place, London.

■ Nair Hospital Dental College Affiliates with Bombay University

Nair Hospital Dental College has affiliated with the University of Bombay it has been announced by V. M. Desai, dean of the college. A candidate who has passed the intermediate examination in science of the Bombay University or that of another recognized school is eligible for admission to the dental school. Some 60 students are admitted each year.

■ Dental Schools Association, IADR to Meet in March

The American Association of Dental Schools will meet March 21-23 in Chicago. Information on the meeting may be obtained by writing to M. W. McCrea, AADS secretary, Baltimore College of Dental Surgery, University of Maryland, Baltimore.

Also scheduled for March is a meeting of the International Association for Dental Research. The meeting will be held March 18-20 in Chicago. Further information is available from IADR secretary E. H. Hatton, 2419 Simpson St., Evanston, Ill.

■ Tufts Dental School Announces Winter and Spring Courses

Courses of interest to dental surgeons are being offered by Tufts College Dental School in Boston during the winter and spring months. A course in general anesthesia will be taught by Daniel J. Holland and staff Wednesdays, December 15 to February 16. General anesthesia at the Boston City Hospital is offered Wednesdays, March 2 to April 20. Instructors are Stephen P. Mallett and staff. Other courses are: intravenous anesthesia for the dental office, March 21-25, Harold Krogh and Adrian O. Hubbell; fractures of the facial bones, Wednesdays, January 12 to March 2, Kurt H. Thoma and Edward L. Sleeper; technics for removal of impacted third molar teeth, May 25, Edward L. Sleeper, and electrosurgery, Wednesday afternoon, April 6 through May 4, Moses Strock.

■ Examinations for USPHS Positions to be Held in March

A competitive examination for appointment of dental officers to the U. S. Public Health Service will be held in various places throughout the country March 15-18. Appointments provide opportunities for career service in clinical dental practice, dental public health and dental research. An assistant dental surgeon with dependents will receive $6,017 a year and a senior dental surgeon with dependents $6,918. Active duty as a U. S. Public Health Service officer fulfills the obligation of selective service.

Requirements for appointment are U. S. citizenship and graduation from a recognized school of dentistry. An applicant must be at least 21 years old. In addition seven to ten years of collegiate and professional training and experience are required.

Application forms may be obtained from the chief of the division of personnel, U. S. Public Health Service, Department of Health, Education and Welfare, Washington 25, D. C. Applications must be filed no later than February 9.

■ Northern California Society of Oral Surgeons Elects Officers

Erwin William Ferber, Harold M. Matteson and Ray J. Weinheimer recently were elected president, president-elect and secretary-treasurer respectively of the Northern California Society of Oral Surgeons for the year 1955.

The northern group will be host to the Southern California Society of Oral Surgeons at the annual meeting June 3-5.

■ Illinois Offers One Year Internship In Oral Surgery

A one year internship in oral surgery beginning July 1, 1955, is offered by the University of Illinois Research and Educational Hospitals in Chicago. A minimal stipend is provided as well as residence at the hospital with room, board, laundry and uniforms. Emphasis will be placed on the practical aspects of oral surgery for both inpatient and outpatient service. Inquiries may be addressed to D. J. Caseley, M.D., medical director, University of Illinois Research and Educational Hospitals, 840 S. Wood St., Chicago.